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THE PENNSYLVANIA MUSEUM
AND
SCHOOL OF INDUSTRIAL ART,
PHILADELPHIA.

A
CLASSIFIED AND DESCRIPTIVE CATALOGUE
OF THE
Collection of the Products
AND
Manufactures of British India.

COMPILED (IN 1876) BY
J. FORBES WATSON, M.A., M.D., LL.D., ETC.,
DIRECTOR OF THE INDIA MUSEUM, LONDON, AND REPORTER ON THE PRO-
DUCTS OF INDIA TO THE SECRETARY OF STATE FOR INDIA.

MEMORIAL HALL,
PHILADELPHIA:
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INDIA.

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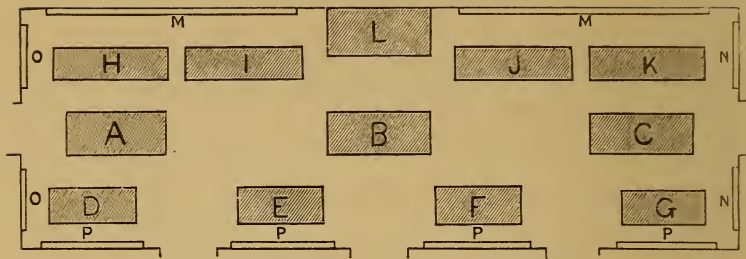
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- I. Rice, Paddy, Dye Stuffs, Materia Medica.
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- P. Photographs of the People of India.

DEPARTMENT I.—MINING AND METALLURGY.

CLASS A.

MINERALS, ORES, ETC.

IRON ORES.

Iron ores exist in great abundance throughout the Indian Peninsula, and are widely distributed; with the exception of the trap area and the alluvial plains, there are few districts where deposits have not been found. The quality is in most cases excellent.

Among the most remarkable deposits are those of magnetic iron ore existing in the neighborhood of Salem, in the Madras Presidency. Here beds of ore from 50 to 100 feet in thickness can be traced for miles. On a hill in this district there are five bands of magnetic ore, from 20 to 50 feet in thickness, running completely round the hill, which is four miles in length. At Lohara, in the Chanda district, Central Provinces, there is a hill nearly two miles long and half a mile broad, apparently formed entirely of an extremely pure ore, a mixture of magnetic and specular ore (see specimen No. '78-262). This would probably yield 300,000 to 500,000 tons of iron, without going below the surface. Limestone and coal occur near this deposit, which is likely to become of more than local importance. The ores of Bundelkund and the Nerbudda Valley are chiefly hæmatites. In the Ranigunj coal field, and other coal fields of the Damuda Valley, clay iron ores abound, containing on an average nearly 40 per cent. of iron.

From the Madras Presidency.

- '78-232. Magnetic iron ore. Travancore.
- '78-233. Hæmatite. Travancore.
- '78-234. Iron ochre. Travancore.
- '78-235. Silicious hæmatite. Pudukota.
- '78-236. Magnetic iron ore. Beypoor. Malabar. Used in making Indian Bessemer steel.
- '78-237. Magnetic iron ore. Honore. Malabar. Used in making Indian Bessemer steel.
- '78-238. Magnetic iron ore. Mysore.
- '78-239. Magnetic iron ore. Mysore.

- '78-240. Hæmatite. Shikarpore. Shimoga. Mysore.
- '78-241. Silicious hæmatite. Anantapore. Shimoga. Mysore.
- '78-242. Hæmatite. Murdium. Mysore.
- '78-243. Hæmatite. Tumkur. Mysore.
- '78-244. Hæmatite. Mudgeri. Mysore.
- '78-245. Hæmatite. Hassan. Mysore.
- '78-246. Brown hæmatite and fibrous limonite. Mysore.
- '78-247. Magnetic iron ore. Moorakcully. Salem.
- '78-248. Magnetic iron ore. Salem.
- '78-249. Magnetic iron ore. Salem. Rusting on surface.
- '78-250. Magnetic iron ore. Salem.
- '78-251. Magnetic iron ore. Salem. In transition to peroxide.
- '78-252. Magnetic iron ore. Salem.
- '78-253. Hæmatite. Palamcotta. Tinneveli.
- '78-254. Brown hæmatite. Arreanathum. South Arcot.
- '78-255. Magnetic iron ore—oxidizing. Madras.
- '78-256. Magnetic iron sand. Sautghur Talook. North Arcot.
- '78-257. Magnetic iron sand. Nimmanapully. Congoondy Talook.
North Arcot.
- '78-258. Magnetic iron sand. Vellore. North Arcot.
- '78-259. Magnetic iron sand. Anchenamput. Vellore.

From the Bombay Presidency.

- '78-260. Iron ore. Poona.
- '78-261. Iron Ore. Mahableshwar.

From the Bengal Presidency.

- '78-262. Magnetic and specular iron ore. Pipalgaon. Chanda.
Central Provinces.

This ore is similar in appearance and composition to the Lohara deposit already alluded to. An analysis of the Lohara ore gave 90.32 per cent. of ferric oxide, and 8.26 of magnetic oxide, together equal to 69.20 per cent. of metallic iron. It contained but .012 per cent of sulphur, .005 of phosphorus, and .823 of silica.

- '78-263. Hæmatite. Tendukera. Saugor and Nerbudda territory.
- '78-264. Hæmatite. Mungrownee. Gwalior. Central India.
- '78-265. Iron ochre. (*Dhaoo*.) Gwalior. Central India.
- '78-266. Hæmatite. Malwa.
- '78-267. Clay iron ore. Tehree. Bundelkund.
- '78-268. Hæmatite. Nerbudda Valley.

- '78-269. Hæmatite. Nerbudda Valley.
- '78-270. Magnetite. Chota Nagpur. Found lying on the high grounds in this state.
- '78-271. Magnetic iron sand. Kot Kai. Himalayas.
- '78-272. Magnetic iron ore. Assam.
- '78-273. Brown hæmatite. Luckimpore. Upper Assam.
- '78-274. Clay iron ore. Gellaka Mouzah. Sebsaugor. Assam.
- '78-275. Magnetic iron sand. Northeast Assam.
- '78-276. Bog iron ore. Rangoon. British Burmah.
- '78-277. Crude iron. Assam.
- '78-278. Wootz steel.
- '78-279. Native iron.
- '78-280. Native iron.
- '78-281. Native iron with slag, partially fused.
- '78-282. Laterite. Travancore.
- '78-283. Laterite. Mysore.

This remarkable rock is widely spread through the Peninsula, and occurs also in Ceylon, Burmah, Malacca, and Siam. It caps the summits of the Eastern and Western Ghats. Under the surface it is soft, and when first exposed can be cut with a spade, but it hardens on exposure to the air, the iron, which in the interior is usually in the form of magnetic oxide, becoming converted into brown hæmatite. The oxide of iron is often accompanied by manganese as pyrolusite. The percentage of iron sometimes reaches 30 or more, when the rock may be used as a source of iron; it is, however, commonly employed for road metalling and as a building material, for which latter purpose, when carefully selected, it is admirably suited. Many opinions have been held as to its origin and age. The true laterite seems to have been formed by the subaërial decomposition of trap or gneiss rock, but no one theory accounts for laterite in all its positions, or satisfactorily for the sources whence the large amount of iron is derived.

- '78-284. Iron pyrites, crystalline and cut into fragments.

CHROMIUM ORE.

Chrome iron ore is found in considerable quantity in Salem, forming a vein in the central part of a tract of country, about ten square miles in area, covered by magnesite veins.

- '78-285. Chrome iron ore. Salem.
- '78-286. Chrome iron ore. South Arcot.

MANGANESE ORES.

Manganese ores, viz., pyrolusite, wad, and psilomelane, are found in the Wardha coal field, Central Provinces, in the Punjab, Burmah, and several localities in the Madras Presidency.

'78-287. Manganese ore.

'78-288. Manganese ore.

COPPER ORES.

Copper has been found and worked on a small scale by the natives in many parts of India. The principal mines are those in Kumaon, Gurhwal, Nepal, Darjiling, Jaipur in Rajputana, and in Dalbhum and Singbhum. The production of metal is very small.

'78-289. Carbonate of copper. Nellore. Madras.

'78-290. Copper glance with chessylite. Singbhum. Lower Provinces.

'78-291. Copper ore; impure carbonate of copper. Singbhum. Lower Provinces. Contains $2\frac{1}{2}$ ounces of silver to the ton of ore.

'78-292. Copper glance with blue and green carbonates. Deoghur. Birbhum.

'78-293. Copper and lead ore. Deoghur. Birbhum.

'78-294. Malachite. Central India.

'78-295. Copper pyrites. Hills of Beluchistan. Upper Sind.

LEAD ORES.

Galena, usually associated with copper, is found in Kulu, Gurhwal, and Sirmur, in the northwest Himalayas, and in Ajmir, Manbhum, Karnul, and Kuddapah, at Sabathu, in the Simla district, and at Chicoli, near Raipur, in the Central Provinces. Silver is generally contained in the ore, but in very varying quantities. An assay of the Chicoli ore gave silver equal to 9 oz. 19 dwts. 6 grns. per ton, of the Manbhum ore silver, equal to 119 oz. 4 dwts. 16 grns. per ton. A sample of antimonial galena, from Chota Nagpur, contained 70 oz. silver per ton, while another sample from the same locality contained no silver.

'78-296. Galena with copper pyrites. Malana Mine. Kulu Valley. Kangra. Analysis gave 57.32 per cent. of lead and 8.10 per cent. of copper.

'78-297. Galena. Parbutti Mine. Kulu Valley. Kangra. Contains 60.4 per cent. of lead, with traces of silver, copper, and arsenic.

'78-298. Galena. Catloor near Kuddapah. Contains silver.

'78-299. Galena. Karnul.

'78-300. Galena. Chota Nagpur.

'78-301. Galena. Duttiah. Bundelkund.

'78-302. Galena. Hazaribagh. Lower Provinces. Occurs sparingly disseminated through a garnet (calderite) and augite rock.

'78-303. Galena. Found on the surface of the soil on the hills of Beluchistan. Upper Sind.

ANTIMONY ORES.

Stibnite (Antimonite) is found in Kulu and Lahoul, in the latter district at Shigri, on the Chandra River. In one of the two lodes at Shigri there is 20 feet of solid ore in the middle of the lode, which is 40 feet in width, and little or none of the gneiss rock, in which it occurs, is associated with the ore. On the surface the products of oxidation, kermesite, and cervantite occur. Stibnite is found also in Borneo. It is called by the natives *surma*, and is used as a cosmetic for the eyes; the *surma* of the bazaars, however, often consists of galena, or even iron or manganese ores.

'78-304. Stibnite. Shigri. Lahoul.

'78-305. Stibnite. Busoh.

'78-306 Stibnite. Borneo.

'78-307. Stibnite. Sarawak.

TIN ORE.

Rich deposits of tin stone occur in the Tenasserim provinces, British Burmah, and throughout the Malayan Peninsula and its adjacent islands. These latter deposits are well known, and have been long worked; they appear to become richer toward the southern termination of the tin area in the islands of Banca and Billiton.

'78-308. Tin stone. Junk Ceylon or Salang Island.

'78-309. Rubble rich in tin ore. Macham Baboo. Province Wellesley.

'78-310. Alluvial soil containing tin stone. Malacca.

'78-311. Tin stone. Malacca.

'78-312. Tin stone. Kuhun.

'78-313. Tin stone. Kuhun.

'78-314. Tin stone. Mergui.

'78-315. Tin stone. Tenasserim.

'78-316. Tin stone. Larut. Perak.

'78-317. Tin stone in quartz. Johore.

'78-318. Tin stone. Johore.

'78-319. Tin stone. Johore.

GOLD ORE.

Gold occurs in many parts of India in the stream gravels, but always in very small quantities; only the poorest of the natives are occupied in washing for it. It is extracted in some parts of the Punjab, in Chota Nagpur, Manbhum, Singbhum, the Godaveri Valley, and a few places in Southern India, and in Assam and Burmah.

The Malabar district has been noted for gold from time immemorial. Two tribes of people obtained it, one from the alluvium, etc., and the other from quartz "leaders" in the hill country. It is also found on the seashore about Beypoor. Several auriferous quartz reefs occur in the Wynad. Preliminary trials on different reefs gave an average proportion of 7 dwts. of gold to the ton of ore, this matrix gold containing 86.86 per cent. of pure gold. The alluvial gold of the same district contains 91.95 per cent. of pure gold.

- '78-320. Gold sand. Purulia. Chota Nagpur.
- '78-321. Gold sand. Toradanally, Dhenkanal, Cuttack Tributary Mehals.
- '78-322. Gold sand. Dandput, Keonjhur, Cuttack Tributary Mehals.
- '78-323. Gold sand deposited at the mouth of Martaban stream, a tributary of the Shoay Gyeen River. Rangoon.
- '78-324. Gold sand. Ramagherry, Colar district. Mysore.

ARSENIC.

Orpiment (*Harital*) is found in the northern parts of the Kumaon district, as well as in Burmah, etc.

Preparations of arsenic enter largely into the composition of native drugs, and are extensively used, both medicinally and criminally.

- '78-325. Orpiment. Pegu.
- '78-326. Orpiment. Burmah.
- '78-327. Orpiment. Tenasserim.
- '78-328. Realgar (*Manavasala*). Bengal.
- '78-329. Crude arsenic. Madras.

GRAPHITE.

Graphite is found in workable quantities in Travancore, Kumaon, Ceylon, and Sikkim.

- '78-330. Graphite from the bottom of a laterite hill at the base of the Ghats. Caviatten Coodul.
- '78-331. Graphite. Trevandrum. Travancore.
- '78-332. Graphite, washed. Trevandrum. Travancore.
- '78-333. Graphite in laterite, found near the surface, 12 miles from Trevandrum.
- '78-334. Graphite, 20 miles northeast of Trevandrum.
- '78-335. Graphite. Trevandrum.
- '78-336. Graphite.
- '78-337. Graphite. Almorah. Kumaon. Found in nodules near the surface.
- '78-338. Graphite. Ceylon.

SULPHUR.

This element is found in small quantities in the Puga Valley, N. W. Himalayas, in Kumaon, Gurhwal, the Punjab, S. E. Affghanistan, Beluchistan, and Burmah.

'78-339. Sulphur. Rangoon.

'78-340. Sulphur mines near Shoruns. Beluchistan.

CORUNDUM.

This mineral is found in abundance in Salem, Mysore, and other localities in the Madras Presidency; it also occurs in the Punjab, and at Rewah in Bundelkund, where it is associated with jade. The precious forms of alumina, viz., Oriental rubies, sapphires, amethysts, etc., are not found in India itself, but in Ceylon, Independent Burmah, and the countries northwest of the Himalayas.

'78-341. Corundum. Madras.

'78-342. Corundum. Madras.

'78-343. Corundum. Salem. In hexagonal prisms.

'78-344. Corundum. Salem.

'78-345. Corundum. Salem.

'78-346. Corundum. Mysore.

MINERALS USED FOR ORNAMENT.

'78-347. Ruttunpoor agates, unburnt.

'78-348. Ruttunpoor agates, burnt.

'78-349. Sone river pebbles.

'78-350. Rough carnelians. Cambay.

The carnelians and agates from Cambay, which have been known since the time of the Romans, are derived from immense beds in the debris of the trap rock in the Rajpiilee Hills, near Ruttunpoor, 13 miles east of Broach. They are cut and polished by the lapidaries of Cambay and Jubbulpore.

'78-351. Gem sand. Ceylon. Containing zircons, spinels, tourmalines, sapphires, etc.

'78-352. Ruby sand. Travancore.

'78-353. Rough garnets. Ruby River, Mysore.

'78-354. Rough garnets. Vizianagram.

'78-355. Garnets (carbuncles), cut *en cabochon* and polished.

'78-356. Calderite. A massive iron-lime garnet found in Nepal and near Hazaribagh.

'78-357. Schorl (tourmaline), in quartz. Nellore. Madras.

'78-358. Tourmaline. Nellore. Madras.

'78-359. Epidote granite. Carangooly, Chinglepat. Madras.

'78-360. Epidote granite. Bodinatham, N. Arcot. Madras.

This handsome rock is found in a few other localities, as in South Mirzapur, Bancoorah, and Rupshu, in the N. W. Himalayas.

LIMESTONES, ETC.

'78-361. Kunkur. South Arcot. Used as a flux at Trinamalee.

'78-362. Kunkur. Nellore. Madras.

'78-363. Limestone. Tripattur. Salem.

'78-364. Calc spar. Masulipatam. Madras.

'78-365. Kunkur. Beronda. Bundelkund.

Kunkur is a nodular fresh-water limestone, occurring in most parts of India. It is usually concreted round a fragment of wood, shell, etc. It contains on an average about 72 per cent. of calcium carbonate, 15 of silica, and 11 per cent. of clay; the deposits sometimes attain a thickness of 60 or 70 feet.

'78-366. Calcite. From the coal fields near Ranigunj. Used as a flux and in the manufacture of cement. It occurs in boulders 200, 300, or more cubic feet in capacity.

'78-367. Calc spar. This is found in Kabul, and is used by the inhabitants of the Punjab medicinally under the name of "Surma safaid," white antimony. It is used for the same purposes as sulphide of antimony.

'78-368. Fibrous gypsum and other varieties of sulphate of calcium. Karnul.

'78-369. Selenite. Crystallized sulphate of calcium.

'78-370. Steatite or soapstone. Ava.

This mineral is common; the most valuable varieties are found in Karnul, Salem, Mysore, near Chittoor, and at the Naggerly Hills.

'78-371. White mica. Salem.

'78-372. Black mica.

Mica is found abundantly in Behar, and the Northern Circars.

'78-373. Agalmatolite, or figure stone. Found near Chota Nagpur.

'78-374. Fullers' earth. Sind.

'78-375. Zeolites. Heulandite, and stilbite, on trap rock. Deccan.

'78-376. Zeolites, with apophyllite on trap rock. Deccan.

'78-377. Amygdaloid rock, containing zeolites, etc. Green earth. Deccan.

These hydrated double silicates, together with calc spar and quartz, are very abundant in the vesicles of the trap of the Deccan.

'78-378. Reh. Buttiana.

A saline efflorescence occurring on soils, and rendering them unfertile. It is especially noticed in the lands irrigated by the Ganges and Jumna Canal, and in parts of the Punjab. It consists mainly of sodium sulphate and sodium chloride; when dry containing from 76-96 per cent. of the former to 24-4 per cent. of the latter. Kunkur is usually found underlying the reh. It is valuable in the alum manufactures. Some varieties contain considerable quantities of sodium carbonate, and are then used for making soap and a rough kind of glass.

CLASS B.

COAL AND COMBUSTIBLE MINERALS.

The coal fields of India lie in a region bounded on the north by the Ganges, and extending beyond the Godaveri on the south; from east to west, they stretch from the neighborhood of Calcutta to some distance down the Nerbudda. Outside these limits there are coal fields in Upper Assam, the Khasia Hills, and Burmah. The total area over which coal rocks may be presumed to extend is 35,000 square miles, making India fifth in the coal-bearing areas of the world—the United States, China, Australia, and Russia only being before it. Nearly all the coal comes from one geological formation called "Damuda," from the river in whose valley some of the principal coal seams occur. Some of the seams, including partings, are of gigantic size in the Hengir and Damuda fields, reaching 100, 120, and even 160 feet in thickness. The coal that has hitherto been worked is characterized by its excessive lamination and great quantity of ash, this being rarely under 10, and reaching to 30 per cent.; the percentage of fixed carbon is rarely 60 per cent., and averages about 52 per cent. The coal of Assam and of the Khasia Hills is of better quality.

'78-379. Coal. Gurrawarra. Central Provinces. Nerbudda Coal and Iron Company's pits.

'78-380. Coal. Oormoo. Alubera. Near the Bansloi stream in the centre of the Rajmahal Hills. Seams seven feet and three feet.

Contains—Fixed carbon,	.	.	.	.	45.0
Volatile matter,	.	.	.	.	44.6
Ash,	.	.	.	.	10.4

'78-381. Coal. Chigo. Alubera Collieries. Five foot seam.

'78-382. Coal. Malacca.

'78-383. Lignite. Darjiling. Small irregular masses and strings of lignite are met with in the sandstone.

'78-384. Petroleum. Burmah.

'78-385. Naphtha. Burmah.

Petroleum is found in abundance in Burmah, especially in the neighborhood of Rangoon. There are also wells in the islands of Ramree and Cheduba. The

specific gravity of the petroleum varies from .815 to .909. Petroleum is also found in Assam, having a specific gravity of .971.

CLASS C.

CLAYS AND OTHER MATERIALS USED IN POTTERY, AND EARTHY MINERALS.

- '78-386. Clays for pottery. South Arcot. Madras.
- '78-387. Clay for pottery. Madura.
- '78-388. Powdered mica. (*Abrak.*) Lahore. Ready for mixing with lime for ornamental plaster, etc.
- '78-389. Clay for pottery. North Arcot. Madras.
- '78-390. Clay for pottery. Sadigeri. North Arcot.
- '78-391. Clay for pottery. Bangalore. From decaying granite.
- '78-392. Clay for pottery. Vizianagram. From decaying albite.
- '78-393. Quartz, used in the manufacture of glass, etc.
- '78-394. Yellow ochre. Madras.
- '78-395. Red ochre. Madras.
- '78-396. Fire clay. Madras.
- '78-397. China clay. Madras.
- '78-398. Ball clay. Mangalore. South Canara.
- '78-399. Porcelain clay. Canara. Bombay.
- '78-400. Ball clay. Raepore. Central Provinces.
- '78-401. Raw clay. Pattan. Gujerat.
- '78-402. Clay, prepared. Pattan. Gujerat.
- '78-403. Fine white clay. Pattan. Gujerat.
- '78-404. Powdered marble. Pattan. Gujerat.
- '78-405. Red ochre. Pattan. Gujerat.
- '78-406. Red lead. Pattan. Gujerat.
- '78-407. Litharge. Calcutta.
- '78-408. White lead. Punjab.
- '78-409. White earth. Beronda. Bundelkund.
- '78-410. "Geroo." Fine red ochre. Raepore.
- '78-411. Pink earth. Paldeo. Bundelkund.
- '78-412. Yellow earth. Paldeo. Bundelkund.
- '78-413. White earth. Punnah. Bundelkund.
- '78-414. Yellow earth. Alipore. 24 Pergunnahs.
- '78-415. Pipe clay. Singapore.
- '78-416. Red clay. Duttiah. Bundelkund.
- '78-417. White earth. Kotee. Bundelkund.
- '78-418. Decaying granite.

LIMES.

- '78-419. Lime. Bownee. Bundelkund.
 '78-420. Lime from the limestone of the Shevaroy Hills. Salem.
 '78-421. Lime. Bellary.
 '78-422. Lime. Soonporah. Sudujah. Upper Assam.

DEPARTMENT II.—MANUFACTURES.

CLASS D.

CHEMICAL.

SALT.

The salt deposits of the Salt Range, hills running through the Jhilam and Shahpur districts, and on to Kalabagh, are equaled by none in the world for extent and purity. Salt is excavated at four places—at the Mayo mines, Kheora, and Sardi mines in the Jhilam district, at Warcha mine in Shapur, and at Kalabagh, where the salt is quarried from the surface. In the Trans-Indus district of Kohat, salt is obtained from a chain of hills running from the Indus toward Bohadur Kheyl; that found near the surface is of a black or dark green color, but the greater portion is remarkably pure.

The consumption of salt in Bengal amounts to nearly 10 lbs. per head per annum, in the Madras Presidency to about 12 lbs. and in the Bombay Presidency to 9½ lbs. per head per annum. Until 1863 the districts on the seaboard of the Bay of Bengal were divided into salt agencies, and two kinds of salt were produced—*Pungah* salt, obtained by boiling highly concentrated brine to dryness, and *Kurkutch* salt, produced from sea water by solar evaporation alone. In 1863 the government manufacture was abolished, and a system of excise, with duty on imported salt, was instituted. There is a manufacture under excise on the shores of the Chilka lake in the Puri district of Orissa. In the N. W. Provinces the salt supply is mainly derived from Sambhur and other salt lakes in Rajpootana. In the Bombay Presidency there are salt works on the shores of Gujerat and at Kheraghora, and large quantities are made by solar evaporation in the Runn of Kutch.

- '78-423. Rock salt. Salt Range. N. W. Himalayas.
 '78-424. Rock salt. Salt Range. N. W. Himalayas.
 '78-425. Salt. Poorthemauk. Madras.
 '78-426. Salt.
 '78-427. Salt. Nellore.

- '78-428. Salt, refined. Nellore.
- '78-429. Common salt. Toomlook. Midnapore. Bengal.
- '78-430. Common salt. Pungah salt. Cuttack.
- '78-431. Common salt. Pungah salt. Balasore. Cuttack.
- '78-432. Common salt. Cuttack.
- '78-433. Common salt. Hidgelee. Bengal.
- '78-434. Common salt. Hidgelee. Bengal.
- '78-435. Common salt. Ghat Kissennuggur. Hidgelee.
- '78-436. Common salt. Cuttack.
- '78-437. Common salt. Jeypore. Rajpootana.
- '78-438. Common salt in crystals. Patree. Ahmedabad.
- '78-439. Common salt, whole. Patna. Bengal.
- '78-440. Common salt, ground. Patna. Bengal.
- '78-441. Common salt, used for salting hides.
- '78-442. Common salt. Sambhur. Rajpootana.
- '78-443. Black salt. Calcutta. Used medicinally in a great number of cases. It contains sulphide of sodium, and is manufactured by heating certain fruits, etc., with common salt and *sajji*, or crude carbonate of sodium containing much sulphate.

SALTPETRE.

This salt (nitrate of potassium), called *Shorah*, occurs in many parts of India as an incrustation on the soil, and mixed with it to some depth, though not lower than the air can penetrate. The soils producing it must be rich in alkaline, or alkaline earthy bases, to fix the nitric acid, formed by the oxidation of organic (especially animal) matter, as soon as formed. It also effloresces on old mud walls, cow-house walls, and about ruins and old villages. Nearly the whole of the exports of saltpetre are from Bengal. To prepare the saltpetre the nitrated earth is boiled with water, filtered, concentrated by the heat of the sun, and afterward evaporated with artificial heat. In some parts of the Punjab the earth is packed in coarse vessels with a small aperture at the bottom, a layer of straw is placed at the bottom to act as a filter, then a layer of wood ashes, and finally the nitrated earth; water is then percolated through, and the extract evaporated. This treatment with wood ashes, which converts other nitrates, especially nitrate of calcium, into the potassium salt, is not carried out in Bengal, where the soil already contains much potash. Saltpetre is prepared in many places for local uses only, *e. g.*, the manufacture of gun-power, fireworks, and frigorific mixtures.

- '78-444. Saltpetre or nitre. Cutch.
- '78-445. Saltpetre or nitre. Sarun. Bengal.
- '78-446. Saltpetre or nitre. Bengal.

- '78-447. Saltpetre or nitre. Ahmednuggur. Bombay.
- '78-448. Saltpetre or nitre. Lahore. Punjab.
- '78-449. Saltpetre or nitre. Central India.
- '78-450. Saltpetre or nitre. Ellore. Masulipatam.
- '78-451. Saltpetre or nitre, 1st sort. Nellore.
- '78-452. Saltpetre or nitre, 2d sort. Nellore.
- '78-453. Saltpetre or nitre, refined. Cawnpore. N. W. Provinces.
- '78-454. Saltpetre or nitre. Salem. Madras.
- '78-455. Saltpetre or nitre. Bengal.
- '78-456. Saltpetre or nitre. Madras.
- '78-457. Saltpetre or nitre, purified at Calcutta.

ALUM.

This salt is manufactured to a large extent at Mhurr in Cutch; the works are said to have been carried on for the last four or five centuries. The material used is a dark pyritous shale, which is exposed for four months in heaps and sprinkled with water. The efflorescence, called "seed of alum," is boiled with nitre, or with an alkaline salt made by burning the village refuse, treating the ash with water, filtering and boiling down. Alum is also made from a black shale at Kalabagh on the Indus, and at Kuthi in the Chicalli Range, beyond the Indus. A native sulphate of alumnium, arising from the oxidation of pyrites in aluminous shales, occurs in the mountains of Kumaon and in Nepal. It is called *Salajit*, and wonderful medicinal virtues are attributed to it; in the plains it often sells for its weight in silver.

- '78-458. Alum. Madras bazaar.
- '78-459. Alum. Lahore bazaar. Punjab.
- '78-460. Alum. Bengal.

CARBONATE OF SODA.

Impure carbonate of soda, Dhobies' earth or *sajji mutti*, occurs as an efflorescence in almost every district in India. It is used in the manufacture of native soap and glass.

- '78-461. Crude carbonate of soda. Sind.
- '78-462. Crude carbonate of soda. Calcutta.
- '78-463. Anhydrous sulphate of iron. Salt Range. Occurs in large masses in the ground.

BORAX.

Borax, *sohaga* or tincal, is obtained in considerable quantities in Puga Valley, Ladakh, and from lakes in Thibet. It is collected on the edges of the lakes, and transported across the Himalayas on sheep and goats, and refined at Umritzur and Lahore.

'78-464. Borax in native crystals. Thibet.

'78-465. Borax. Thibet.

SAL AMMONIAC.

'78-466. Sal ammoniac. "*Naushadar*." Kurnal. Punjab.

Sal ammoniac (chloride of ammonium) has been manufactured for ages by the potters of the Kaithal and Gula tahsils of the Kurnal district. To obtain it, from 15,000 to 20,000 bricks of a dirty clay or mire found at the bottom of ponds are placed round the outside of each brick kiln; when about half burnt the raw substance from which *Naushadar* is made exudes, and adheres to the exterior of the bricks. This is purified by solution, crystallization, and subsequent sublimation in large closed vessels of thin black-colored glass.

In Oude it is manufactured from the contents of cesspools.

'78-467. Sal ammoniac. Calcutta.

'78-468. Sulphate of copper. Blue vitriol. Calcutta. Used medicinally, and in making astringent tooth-powders.

CLASS E.

PAINTS AND DYES.

'78-469. Gamboge (*Garcinia morella*). Bombay.

'78-470-3. Indigo, four samples (*Indigofera tinctoria*). S. Arcot, Moorsshedabad, Madras, Shikarpore.

'78-1312. Indigo.

The history of the commerce of this substance would be eminently interesting, but it is not possible to enter on the subject here; suffice it to say, that, on its first introduction into Europe, it was almost driven out by the bitter intolerance of persons whose object was to prevent the old-fashioned *woad* (then in use as much as indigo is now) from being driven out before it. In 1557, at Frankfort, it was denounced by the Germanic diet as the "devil's dye," and its use forbidden. The prohibition was repeated in 1603; and as late as 1654, by imperial edict at Ratisbon, the proscription was enforced. In England an Act was made in Elizabeth's time, authorizing the seizure and destruction of the offensive substance, as well as the detention of persons possessing it. The Act continued in force till the reign of Charles II, and "Brazil wood" shared the odium with it.

Indigo is known to chemists under two forms—white indigo (indigogene) and blue indigo, the latter being only an oxidized state of the former. The blue color is entirely due to the oxygen, or at least comes to the substance as it gets access to the oxygen of the air; this is observable in the vats. When the fermented liquor or infusion of the plant first ferments with the appearance of whitish gray bubbles, afterward these become blue, and finally a deep, metallic lusted purple red. Dyed cotton, when just taken out of the dyeing vat,

appears green, but rapidly assumes its deep blue tone from contact with the air. Blue indigo is perfectly insoluble in water, but it is found that it is so only so long as it retains its excess atom of oxygen. If it can be induced to part with that, the remaining indigogene is soluble in an excess of sulphate of lime, or rather alkali. Hence, for cotton dyeing, the vat is prepared by grinding up a quantity of indigo with water to the consistency of cream, and then mixing it with copperas and an excess of lime or alkaline water. The oxygen of the indigo then combines with the protoxide of iron in copperas to form oxide, and then the deoxidized indigo readily combines with the lime water, forming a yellowish green liquid, into which the fabric to be dyed is plunged; and then, on being taken out and exposed to the air, the oxygen returns to the solution with which the fabric has been saturated, and the deep blue is restored and becomes permanent without the use of any mordants. The dye applied in this manner is used cold. According to the plan adopted by native dyers, "chunám," "sajji" (crude potash), and "gurh" (molasses) form the solvent and deoxidizing agents; otherwise the process is identical. They do not use copperas, though they have it in plenty in the form of "lúra kasís," or "kalú safed." Wool and silk are not dyed in this way, but in another manner, taking advantage of another property of indigo. Pure indigo is soluble in sulphuric acid, but the solution is thick and black. This has been called *cæruleo sulphuric acid*, *sulphindyllic acid*, etc. ("murabba" in Urdú), because it has the nature of both the indigo and the acid, neither undergoing the slightest change in itself. This latter substance is not a sulphate of indigo; that would imply a chemical combination between the acid and the dye, and the formation of a new substance, but it is not so. The acid and indigo combine, but neither is changed. This solution is capable, however, of destruction by an excess of caustic alkali, and turns by it to a yellow color, from which nothing will restore it.

This sulphindyllic acid is principally employed in dyeing wool and silk, and the excess acid is removed by washing in alkali.

Chemically pure indigo is of specific gravity 1.50, and possesses neither taste nor smell; it is a substance "indifferent," having neither acid or basic properties. Good indigo is known by its fine purple blue color, and by its fracture, which, when rubbed with a hard, smooth substance, exhibits a coppery red lustre. No remarks need here be added on the manufacture of indigo. The ordinary process of fermentation, of drawing off the liquor, of beating, and of collecting the "fecula," or precipitate of indigo, from the liquor and pressing it, are universally well known, and are followed with but trifling variations in different provinces and different manufactories.

The main points appear to be the watching the soaking plants, so as to be able to tap off the infused liquor exactly at the right point of fermentation, and next, to beat the liquor in the second vat exactly long enough. No doubt in these points the native manufacturers in this province are as yet eminently deficient. Knowledge of these things can only be acquired by careful observation and long experience. Another point is, that the "fecula" is much improved, after being collected, by being boiled in copperas, and then pressed into its boxes.

Indigo manufactured by simply collecting the fecula, and dropping it down in cakes to harden in the sun, is termed "*gaud indigo*."—(*Baden Powell's "Punjab Products."*)

- '78-474-7. Cutch, 4 samples (*Acacia catechu*). Calcutta, Madras, Burmah.
- '78-478-9. Gambier, 2 samples (*Nouclea gambir*). Bombay, Malacca.
- '78-480. Lac dye (in cakes). Jubbulpore.
- '78-481. Lac dye (in cakes). Malwa.

CLASS F.

EARTHENWARE.

- '78-8. Water-jug. Patna.
- '78-9. Water-jug. Patna.
- '78-10. Water vessel, painted. Jhallawar.
- '78-11. Box. Allahabad.
- '78-12. Hookah bowl (chillum). Patna.
- '78-13. Hookah bottom. Patna.
- '78-14. Water vessel. Madras.
- '78-15. Water vessel, unglazed. Jhallawar.
- '78-16. Water vessel, glazed. Jhallawar.
- '78-17. Water vessel. Patna.
- '78-18. Water vessel. South Canara.
- '78-19. Glazed green cup. Hyderabad. Sindh.
- '78-20. Dish and cover. Hyderabad. Sindh.
- '78-21. Glazed vase. Hyderabad. Sindh.
- '78-22. Water vessel. Madras.
- '78-23. Water vessel. Madras.
- '78-24. Water vessel. Allahabad.
- '78-25. Glazed bowl and cover. Hyderabad. Sindh.
- '78-26. Goblet. Vizagapatam.
- '78-27. Pitcher. Madras.
- '78-28. Pitcher. Bombay.
- '78-29. Jug. Madras.
- '78-30. Milk pan. Madras.
- '78-31. Soapstone cup. Allahabad.

CLASS G.

ENAMELLED TILES.

- '78-32-3. Ornamental tiles (2 pieces). Hyderabad.
- '78-34-6. Ornamental tiles (4 pieces). Hyderabad.

POTTERY.

Process of making and glazing earthenware in Sind.—The clay required for this purpose is obtained 10 feet under ground, in situations which have been inundated. It is reduced to a fine powder and soaked in water for 24 hours, after which it is kneaded with the hands and feet until it becomes dough-like. Lumps proportionate to the articles to be made are then mounted on a wheel and formed into the required shape. After the vessels have dried, they are again put on the wheel, and finished by means of an iron tool. Tiles are prepared in moulds, and when dried are rubbed over with a piece of wet cloth and beaten with an earthen "maul" for the purpose of smoothing the surface; they are then kept for two or three days, or more, until they become sufficiently firm, and after having been cut to the proper size, are piled on layers in the sun to dry.

The vessels, tiles, etc., having been sun-dried, may then be sent to the kiln, after which the required pattern is traced on them in the following manner: A perforated paper pattern is placed upon the article, and powdered charcoal sprinkled over it. On removing the paper the pattern remains on the earthenware, and is then brushed over with a solution called "Sahree," the description of which is given below.

When this is dry, glaze of the required color is prepared and poured over it; the article is then allowed to dry again, after which it is placed in the glazing kiln and subjected to the required amount of heat. The articles are only removed after the kiln has become cold.

Preparation of "Sahree."

"Sahree" is clay found only in the vicinity of Sehwan, and vended at Hydrabad (Sind) at a rupee per maund (82 lbs.). When required for use it is put into a large vessel over night, with water enough to cover it. In the morning it is found to have attained the consistence of paste, and this being strained, it is ready for use.

Preparation of "Moordarsing" (Litharge).

For *green* coloring two pounds of "Sendoor" (red lead), one pound of "Warree" (sand), and a quarter of a pound of carbonate of copper are mixed together and put into an unbaked vessel previously plastered over on the inside with a mixture of "Warree" (sand) and "Sahree" (clay). This vessel is then placed in a heated oven, when the articles are melted together and form a hard substance, used for coloring green. When required for use, it is ground to powder in a hand-mill, sifted, and mixed with wheat paste.

For *red* or *yellow* coloring, the process is the same as above described, substituting red "Dha" or earth for the carbonate of copper.

For *purple* coloring, instead of a solution of "Sahree" the baked tile or vessel is washed over with black "Dha" (earth), and the "Moordarsing" for red or yellow coloring is used as a glaze.

For *blue* coloring or glazing, lime obtained from flint is freely powdered, sifted, and mixed with wheat paste. This mixture is poured over the unbaked article and allowed to dry. "Lajwurde," a blue color, is then ground on a

stone, with water, to the consistence of paste, and brushed over the prepared article. When dry, "Kashee" or white glazing matter is put on, and the vessel placed in the kiln as before.

If the "Lajwurdé" (Lapis Lazuli) used in the last process be omitted, the result will be simply a white glaze.

"Cashee-jo-rung" or glazing composition.

This is made of four parts of "Chaneo" (alkaline earth) and one part of "Jubbul-jee-waree" (hill sand). These are mixed together and placed in the kiln to melt. The substance thus obtained by fusion becomes the glazing material, when it is added to paste and used as other pigments.

CLASS H.

METAL UTENSILS.

- '78-37. Brass box to hold areca nuts. Calcutta.
- '78-38. Copper lamp. Calcutta.
- '78-39. Brass cup. Benares.
- '78-40. Brass cup. Bengal.
- '78-41. Copper water vessel. Bengal.
- '78-42. Copper and brass cup. Bombay.
- '78-43. Sweetmeat plate. Calcutta.
- '78-44. Betel box inlaid with silver. Hyderabad.
- '78-45. Cup made of mixed tin and brass. Odyopore.
- '78-46. Spice box. Patna.
- '78-47. Rose-water sprinkler made of mixed tin and brass. Odyopore.
- '78-48. Brass cup. Indore.
- '78-49. Brass dish for sweetmeats. Calcutta.
- '78-50. Copper bell. Burma.
- '78-51. Lock and key. Indore.
- '78-52. Lock and key. Indore.
- '78-53. Lock and key. Indore.
- '78-54. Brass bowl (Jumbir). Mirzapore.
- '78-55. Copper bowl. Madras.
- '78-56. Brass cup. Travancore.
- '78-57. Brass basin. Travancore.
- '78-58. Brass basin with figured sides. Nepal.
- '78-59. Spitting-dish. Cachar.
- '78-60. Hanging lamp. Madras.
- '78-61-2. Stand lamps (two). Madras.
- '78-63. Upright lamp. Madras.
- '78-64-5. Swing lamps (two). Madras.

- '78-66. Sacred bra
- '78-67. Copper am
- '78-68. Brass spoon for oil. Madras.
- '78-69. Turned brass bowl and cover. Poonah.

CLASS I.

MATTING.

- '78-218. Phulgat mat. Travancore.

CLASS K.

COTTON FABRICS, PLAIN.

- '78-70. Muslin (Jamdanee). Dacca.
- '78-71. Muslin, plain. Dacca.
- '78-72. Muslin (Nyvo Soak). Dacca.
- '78-73. Muslin (Arnee). Madras.
- '78-74-5. Cotton pieces (two). Madras.

CLASS L.

RAW SILK AND COCOONS.

- '78-482. Raw silk (yellow). Surdah, Bengal.
- '78-483. " " " " " "
- '78-484. " " " " " "
- '78-485. " " " " " "
- '78-486. " " " " " "
- '78-487. Raw silk (tape chussam). Bengal.

At the present time the production of mulberry-worm silk is principally confined to the Lower Provinces of Bengal and to the districts of Rajshahye, Maldah, Moorshedabad, Midnapore, Beerbhoom, Hooghly, Burdwan, Bogra, Howrah, Nuddea, Jessore, and the 24 Pergunnahs. The five first are the great silk-producing districts. In the district of Rajshahye there are 34 filatures owned by Europeans, and 63 owned by natives, or 97 in all, containing 5,760 basins, and employing between 11,000 and 12,000 hands. The yield of raw silk is estimated about 400,000 lbs., and it is believed that no less an area than 150 square miles is under mulberry cultivation, while a quarter of a million of people derive their support from the trade in one or other of its branches in this one district alone.

- '78-488. Tusseh silk thread. Bengal.
- '78-489. Tusseh silk thread. Gyah.
- '78-490. Tusseh silk thread. Bhagulpore.
- '78-491. Tusseh silk thread. Bengal.

The Tusseh silkworm is the most important and widely distributed of the wild-silk producers of India, being found in the Sub-Himalayan tracts almost throughout the extent of the range, through the hills from Assam to Chittagong, in the Soonderbuns, everywhere in the great belt of hill and forest inhabited by the Sonthal, the Kol, the Khond, and the Gond, in the Western Ghâts, and in portions of the Madras and Bombay Presidencies. The worm is multivoltine, but it is not clear how many times in the year it goes through its transformations, or whether its periods of existence may not vary according to conditions of climate. It feeds variously on the Ber (*Zizyphus jujuba*), country almond (*Terminalia catappa*), Asun (*Term. alata*), Saj (*Term. tomentosa*), Seemul (*Bombax heptaphyllum*), Sal (*Shorea robusta*), and other trees. In some parts no attention whatever is paid to the rearing of the worms, the cocoons being simply collected by certain classes of the people from the trees in the forests in which they occur. They are afterward sorted according to size, thickness, color, etc., and carted off to the dealers. In other parts a batch of the wild cocoons are selected, the moths allowed to emerge, and the sexes paired; the eggs thus procured are hatched, and the young worms then placed upon the trees; in this partial state of domestication the rearers tend the insects through all their stages, but depend entirely on the wild cocoons for each year's stock.

The method of reeling is primitive in the extreme, and to its imperfections is attributed the scant attention this valuable and very beautiful silk has hitherto received.

The Eria or Arindya silkworm is reared in Assam, and a tract to the southwest of that province, comprising the districts of Dinagepore, Rungpore, and part of Bhagulpore and Purneah. The worms are fed in the houses principally upon the leaves of the castor-oil plant (*Ricinus communis*), and yield seven or more broods in the year. It is reared chiefly by low-caste Hindoos, Mekirs, and Cacharees. The cocoons are mostly of a light rust color; some, however, are also white. The silk is carded, not reeled, in consequence of the resinous nature of the binding matrix of the cocoon. Most of the silk is used for home consumption.

CLASS M.

RAW SILK, DYED.

- '78-498. Floss silk, dyed (various colors). Umritsur.
- '78-499. Floss silk, dyed (various colors). Punjab.
- '78-500. Floss silk, dyed (various colors). Vellore, Madras.

- '78-501. Floss silk, dyed (various colors). Tatta.
 '78-502. Floss silk, dyed (various colors). Cashmere.

CLASS N.

SILK FABRICS, PLAIN.

- '78-76. Tusseh silk piece, plain. Beerbhoom.
 '78-77. Mushroo piece (satin and cotton back). Hyderabad, Decan.
 '78-78. Silk cloth, coarse. Bogra.

CLASS O.

SILK FABRICS, FIGURED.

- '78-79. Silk piece, gold and crimson striped. Ahmedabad.
 '78-80. Silk piece. Burmah.
 '78-81. Kincob piece. Benares.
 '78-82. Tasseh silk piece, striped. Bhagulpore, Bengal.
 '78-83. Brocade or Kincob, Benares.

CLASS P.

GARMENTS.

- '78-84. Woman's garment (Saree). Madras.
 '78-85. Woman's garment (Saree). Dharwar.
 '78-86. Cashmere coat (Chaga). Lucknow.
 '78-87. Scarf (Kummerbund). Coorg.
 '78-88. Scarf (red net). Delhi.
 '78-89. Scarf, white, embroidered with gold. Presented by Mrs. Amos Taylor.
 '78-90. Child's dress (Jubla). Surat.
 '78-91. Satin apron. Sind.
 '78-92. Woman's silk garment. Sattara.
 '78-93. Man's garment (scarf). Woodaspore, Punjab.
 '78-94. Man's garment (Loongee). Moulton.
 '78-95. Man's garment (Loongee). Sind.
 '78-96. Woman's garment (Thaming). Pegu.
 '78-97. Pinna silk dress skirt. Madras.
 '77-2. Silk scarf, red net with gold border.

CLASS Q.

SHOES, ETC.

- '78-98. Pair of shoes, embroidered. Hyderabad, Sind.
 '78-99. Pair of shoes, embroidered. Gwalior.
 '78-100. Pair of shoes, velvet, embroidered with gold. Sind.
 '78-101. Pair of shoes, velvet, embroidered with gold. Kotah.
 '78-102. Turban, crimson and gold. Madura.
 '78-103. Turban, white with gold border. Madura.

CLASS R.

EMBROIDERED FABRICS.

- '77-3. Black net, embroidered with colored floss silk. Delhi.
 '77-4. Black net, embroidered with colored floss silk. Delhi.
 '78-104. Twenty-six glazed frames, with mounts, exhibiting 104
 photo-lithographs, by W. Griggs, illustrative of the tex-
 tile manufactures of India.

These photographs form portions of the following work illustrating and exhibiting the CHIEF TEXTILE MANUFACTURES OF INDIA.

This work comprises:—

- (a.) Thirteen quarto volumes, containing 720 examples, in the actual material, of the following textile fabrics, viz.:—

1 volume of kincobs or gold brocades, . . .	58 samples.
1 volume of mushroos, . . .	67 samples.
2 volumes of silks, . . .	106 samples.
1 volume of cotton and silk mixtures, . . .	60 samples.
2 volumes of cotton trouserings, . . .	121 samples.
1 volume of bodice (or cholee) pieces, . . .	51 samples.
1 volume of muslins and calicoes, . . .	57 samples.
1 volume of cotton prints, . . .	80 samples.
3 volumes of woollens, . . .	120 samples.

Total, 720

- (b.) One large folio volume, containing 19 lithographic and chromo-lithographic plates, exhibiting the patterns of 64 of the richly decorated scarfs so largely worn by both sexes in India, together with examples of the embroidery applied to the ornamentation of garments, etc.

The various samples and illustrations of which the work consists are accompanied by details as to the length, width, cost, and place of production of the fabrics from which the specimens were originally cut, or from which the illustrations were taken by photo-lithography. The work, therefore, affords a large

amount of practical information, whilst it presents in a convenient form what may be regarded as a very complete *Grammar* of Indian Ornamentation in so far as textiles are concerned.*

CLASS S.

JEWELRY.

- '77-771. Brooch, gold and translucent enamel. Perturbhaar.
Presented by Mrs. Fairman Rogers.

CLASS T.

FANS.

- '78-105. Talc fan, embroidered. Madras.
'78-106. Palm-leaf fan, with lace edgings. Madras.
'78-107-8. Two khus khus fans, made from the fragrant roots of the khus khus grass (*Andropogon muricatum*). Madras.
'78-109. Straw fan. Monghyr.
'78-110. Palm-leaf fan. Madras.
'78-111. Palm-leaf fan. Madras.
'78-112. Silver-handled fan, embroidered with gold, etc. Delhi.
'78-113. Fan made of strips of ivory. Tipperah.
'78-114. Fan made of strips of ivory. Tipperah.
'78-115. Fan made of split straw. Monghyr.
'78-116. Painted palm-leaf fan. South India.
'78-117. Khus khus fan, embroidered with silk. Poona.
'78-118-9. Two fans of tinsel and silk. Madras.
'78-120-1. Two palm-leaf sunshades. Madras.
'78-122. Chowrie, split peacock quill. Poona.
'78-123. Chowrie, split peacock quill. Poona.
'78-124. Chowrie, split peacock quill, with silver handle. Hyderabad. Deccan.
'78-125. Chowrie, yak tail. Punjab.
'78-126. Chowrie, split ivory. Sylhet.
'78-127. Chowrie, split sandal wood. Madras.

CLASS U.

FANCY LEATHER WORK.

- '78-128. Leather box, embroidered with quill work. Simla.

* These books can be seen by making application to the Curator.

CLASS V. AND W.

ARMS.

- '76-1581. Large spear head. South of India.
- '76-1582. Spear with pistol attached.
- '76-1583. Steel spear.
- '76-1584. Steel spear.
- '76-1585. Spears (two), with bamboo shaft.
- '76-1586. Leather case for arrows. Lahore.
- '76-1587. Quiver with 24 arrows, green velvet, embroidered with gold. Lahore.
- '76-1588. Quiver with 31 arrows, puce velvet, embroidered with gold. Lahore.
- '76-1589. Coat of mail, steel and brass rings. Punjab.
- '76-1590. Bow. Delhi.
- '76-1591. Bow. Delhi.
- '76-1592. Bow. Delhi.
- '76-1593. Gauntlets (a pair). Punjab.
- '76-1594. Arm cover, green velvet, embroidered with gold. Lahore.
- '76-1595. Arm cover, crimson velvet, embroidered with gold. Lahore.
- '76-1596. Battle-axe, steel head and kooft. Delhi.
- '76-1597. Battle-axe, steel head and kooft. Nagpore.
- '76-1598. Dagger, jumbea shaped, metal mounts, gilt. Deccan.
- '76-1599. Iron mace, hilt inlaid with silver. Bengal.
- '76-1600. Iron mace, shaft covered with leather. Bengal.
- '76-1601. Small sword, with carved blade and ivory hilt. Coorg.
- '76-1602. Sword and leather scabbard.
- '76-1603. Sword and wooden scabbard.
- '76-1604. Sword and wooden scabbard. Malayan Archipelago.
- '76-1605. Short sword and wooden scabbard, with knife inserted in sheath.
- '76-1606. Small barbed spear.
- '76-1607. Small barbed spear.
- '76-1608. Sword and wooden scabbard. Burmah.
- '76-1609. Sword, inlaid with gold, and velvet scabbard.
- '76-1610. Sword with horn handle and scabbard. Malayan Archipelago.
- '76-1611. Sword and scabbard mounted with silver. Bengal.

- '76-1612. Breastplate (two). Lahore.
- '76-1613. Breastplate (two). Lahore.
- '76-1614. Helmet, steel and brass rings. Punjab.
- '76-1615. Matchlock, kooft, and mounted with silver. Rajpootana.
- '76-1616. Matchlock barrel, and mounted with silver. Rajpootana.
- '76-1617. Matchlock, silver mounts. Punjab.
- '76-1618. Matchlock, barrel washed with gold. Punjab.

CLASS X.

MATERIA MEDICA.

- '78-503. Mossed bark. *Cinchona succiruba*. Neilgherries.
- '78-504. Cinchona bark. *Cinchona succiruba*. Neilgherries.
- '78-505. Cinchona bark. *Cinchona succiruba*. Kangra.
- '78-506. Calisaya bark. *Cinchona calisaya*.
- '78-507. Neem bark. *Azadirachta Indica*.
- '78-508. Conessa bark. *Holarrhena antidysenterica*.
- '78-509. Satween bark. *Alstonia scholaris*. Bombay.
- '78-510. Nux vomica bark. *Strychnos nux vomica*.
- '78-511. Pomegranate bark. *Punica granatum*.
- '78-512. Chiretta. *Ophelia chirayta*.
- '78-513. Indian sarsaparilla. *Hemidesmus Indicus*.
- '78-514. Guluncha. *Tinospora cordifolia*.
- '78-515. Pareira brava. *Cissampelos pareira*.
- '78-516. Columba root. *Jateorhiza columba*.
- '78-517. Asgund. *Physalis somnifera*.
- '78-518. Liquorice. *Glycyrrhiza glabra*. Bombay.
- '78-519. Pellitory. *Anacyclus pyrethrum*.
- '78-520. Jatamansi. *Nardostachys Jatamansi*. Madras.
- '78-521. Mishmee teeta. *Coptis teeta*. Assam.
- '78-522. Bish. *Aconitum ferox*. Himalayas.
- '78-523. Aconite. *Aconitum napellus*.
- '78-524. Bish. *Aconitum ferox*. Nepal.
- '78-525. Atees. *Aconitum heterophyllum*.
- '78-526. Black mooslie. Kala mooslie. Source unknown.
- '78-527. Mooslie seeah. *Murdannia scapiflora*.
- '78-528. Galinga. *Alpina galanga*.
- '78-529. Indian pennywort. *Hydrocotyle Asiatica*.
- '78-530. Tinnevelly senna. *Cassia lanceolata*.
- '78-531. Senna. *Cassia acutifolia*. Bombay.

- '78-532. Patchouli. *Pogostemon patchouli*.
- '78-533. Croton seed. *Croton tiglium*.
- '78-534. Chaul moogra. *Hydnocarpus odoratus*.
- '78-535. Gaub fruit. *Embryopteris glutinifera*.
- '78-536. Nux vomica. *Strychnos nux vomica*. Madras.
- '78-537. Poppy heads. *Papaver somniferum*. Behar.

The seeds yield by expression about 50 per cent. of a bland and very valuable oil, of a pale golden color, fluid to within 10° of the freezing point of water. It dries easily, is inodorous, of agreeable flavor, and partially soluble in alcohol. The seed is worth about 61s. in the English market. By simple exposure to the rays of the sun in shallow vessels the oil is rendered perfectly colorless. It is expressed by means of a heavy circular stone, placed on its edge, made to revolve by a long lever, and the apparatus is worked by draught bullocks.

The seed has no narcotic qualities, but has a sweet taste, and is used, parched, by the lower class of natives as a food; it is also much used by the sweetmeat-makers as an addition in their wares.

- '78-538. Muenphue. *Randia dumetorum*.
- '78-539. Colocynth. *Citrullus colocynthis*.
- '78-540. Cassia fistula. *Cathartocarpus fistula*.
- '78-541. Tamarinds. *Tamarindus Indica*.
- '78-542. Star anise. *Illicium anisatum*. Bengal.
- '78-543. Betel nuts. *Areca catechu*.
- '78-544. Sliced betel nuts. *Areca catechu*. Mysore.

The nuts of the Areca palm form the principal ingredient in the famous Oriental masticatory. These are gathered between August and November, removed from the husks in which they grow, and are then boiled till soft, taken out, sliced, and dried in the sun.

- '78-545. Kamala. *Mallotus Phillipinensis*.
- '78-546. Oak galls of *Quercus infectoria*.
- '78-547. Agar agar. *Eucheuma spinosum*. Malacca.
- '78-548. Ceylon moss. *Gracilaria lichenoides*. S. India.
- '78-549. Mysore gamboge. *Garcinia pictoria*. Mysore.
- '78-550. Pipe gamboge. *Garcinia morella*.
- '78-551. Ammoniacum. *Dorema ammoniacum*.
- '78-552. Cocum butter. *Garcinia purpurea*.
- '78-553. Rusot. *Berberis Asiatica*. Nepal.
- '78-554. Aloes. *Aloe vulgaris*. Bombay.
- '78-555. Henbane. *Hyoseyamus niger*.
- '78-556. Untamool. *Tylophora asthmatica*.
- '78-557. Bhang and Gunjah. *Cannabis sativa*.

The dried leaves of the hemp plant are called "Bhang," and the flower-tops, with their resin, "Ganjah." The dried leaves are sometimes smoked alone or mixed with tobacco, but the more common form of taking bhang is to make it up with flour into a cake or sweetmeat called "Majun." Eating this sweetmeat produces great excitement and mania in persons unaccustomed to their use.

- '78-558. Cashmere saffron. *Crocus sativus*. Cashmere.
- '78-559. Mowha flowers. *Bassia latifolia*. Madras.
- '78-560. Cloves. *Caryophyllus aromaticus*. Penang.
- '78-561. Bael. *Ægle marmelos*. Bombay.
- '78-562. Lemon rind. *Citrus limonum*.
- '78-563. Singhara. *Trapa bispinosa*. Bengal.
- '78-564. Coriander. *Coriandum sativum*.
- '78-565. Ajowan. *Anethum sowa*.
- '78-566. Bishop's weed. *Anethum sowa*.
- '78-567. Carraways. *Carum carui*.
- '78-568. Henbane seed. *Hyoscyamus niger*. North India.
- '78-569. Ispaghul. *Plantago ispaghula*.
- '78-570. Dhatoora. *Datura alba*. Bengal.
- '78-571. Gockroo. *Tribulus lanuginosus*. Bombay.
- '78-572. Cardamoms. *Elattaria cardamomum*. Mysore.
- '78-573. Cardamoms. *Cardamomum medium*. Calcutta.
- '78-574. Cardamoms. *Elattaria karia cardamomum*. Travancore.

The Official, or Malabar, Cardamoms are well known in Europe for their medicinal uses, but in India they are equally appreciated and used as a spice or flavoring ingredient, entering into the composition of many native dishes. The plant is a native of the Western coast, and is cultivated in Malabar. In the Travancore forests it is found at elevations of 3,000 to 5,000 feet. The mode employed for obtaining cardamoms is to clear the forests of trees, when the plants spontaneously grow up in the cleared ground.

- '78-575. Black pepper. *Piper nigrum*. Travancore.
- '78-576. Cubebs. *Piper cubebs*.
- '78-577. *Coculus Indicus*. *Anamirta coculus*.
- '78-578. Juniper berries. *Juniperus communis*. Himalayas.
- '78-579. Neil Kalmee. *Pharbitis nil*.

OPIUM.

The cultivation of poppy in India can be traced back as far as the sixteenth century. An allusion is made to the opium and saltpetre monopolies of the Emperor Akber in the reign of Queen Elizabeth, in the celebrated Ayeen Akber of Abul Fuzul, prepared during the latter part of the sixteenth century.

The poppy plant has been cultivated in Nepal for years—doubtless for as long or longer than in Bengal and the Northwestern Provinces; and it may be that the opium from India was first introduced into China by the Nepaulese, and afterward by the Dutch, who used to purchase the drug for export long before the East India Company held possessions in India.

'78-580. Opium. *Papaver somniferum*. Behar.

'78-581. Opium. Ball as prepared for the Chinese market, called "Provision Opium."

'78-582. Blistering beetles (*Mylabris sp.*). Madras. Used as a substitute for European cantharides in Indian Hospitals.

CLASS Y.

WOODEN AND BASKET WARE; PAPIER-MACHÉ.

'78-219-21. Three catjan-leaf baskets. Madras.

'78-222. One catjan-leaf basket. Madras.

'78-223. Catjan-leaf cigar case. Madras.

'78-224. Cane stand, with compartments. Singapore.

'78-225-6. Two grass window shades. Travancore.

'78-227-9. Three cane baskets. Monghyr.

'78-230. Straw basket. Monghyr.

'78-231. Cane bottle stand. Singapore.

'78-129. Lacquered wood box.

'78-130. Lacquered wood box (4 in 1).

'78-131. Lacquered wood trays (a pair).

'78-132. Lacquered wood trays (a pair).

'78-133. Lacquered wood trays (a pair).

'78-134. Papier-maché cigar case. Cashmere.

'78-135. Papier-maché jewel box. Kurnool.

'78-136. Papier-maché pen case (Kalumdan). Hyderabad, Sindh.

'78-137. Papier-maché pen case (Kalumdan). Hyderabad, Sindh.

'78-138. Lacquered wood charpoy leg. Sindh.

'78-139. Lacquered wood charpoy leg. Sindh.

'78-140. Lacquered wood box. Burmah.

'78-141. Lacquered wood box. Burmah.

'78-142. Lacquered wood box. Burmah.

'78-143. Lacquered wood box. Burmah.

'78-144. Hookah-stem. Bengal.

'78-145. Lacquered wood box (bamboo). Burmah.

'78-146. Lacquered wood box (3 in 1). Sindh.

- '78-147. Lacquered wood box. Sindh.
- '78-148. Lacquered wood box (5 in 1). Sindh.
- '78-149. Lacquered wood box (oval with ivory studs). Punjab.
- '78-150. Lacquered wood box (oval). Sindh.
- '78-151. Lacquered wood map case. Sindh.
- '78-152-3. Lacquered wood balls, 3 solid and 1 hollow. Madras.
- '78-154. Lacquered wood table. Sindh.

Fancy articles, boxes, etc., of turned wood, and lacquered in various colors. The object to be lacquered is turned from hard wood, usually shisham (*Dalbergia*). After being smoothed and cleaned it is again fixed in the turner's frame (a kind of lathe worked by hand), and made to rotate. The sticks of lacquer color, consisting of a mixture of lac, resin, coloring matter, and, it is said, a certain proportion of sulphur and beeswax, are then applied to the rotating object; the heat produced by friction is sufficient to soften the lacquer composition, which attaches itself to the wood—producing, however, a dull and streaky appearance. When sufficient color has been applied, the surface of the article is skillfully rubbed with a piece of bamboo having a fine edge, by which the color is evenly distributed, and a polish produced, which is finally completed with oiled rags. To produce the mottled appearance so much admired, a color-stick of a rather harder composition than that used for producing a uniform color is lightly pressed against the rotating object, so as to detach a point here and there. This is repeated with sticks of different colors, and when sufficient color has been laid on, the object is polished with bamboo edges and oiled rags.

CLASS Z.

PLEASURE CARRIAGE.

- '78-155. Model of state carriage (Ekka). Poona.

CLASS A¹.

TRAVELLING VEHICLES.

- '78-156. Model of covered passenger cart. Bombay.
- '78-157. Model of palanquin. Bombay.
- '78-158. Model of luggage cart. Bombay.

DEPARTMENT III.—EDUCATION AND SCIENCE.

CLASS A^{II}.

MUSICAL INSTRUMENTS.

- '78-159. Lithier. Madras.
 '78-160. Sarangi (stringed instrument). Madras.
 '78-161. Kanaga Tappu (instrument of percussion). Madras.
 '78-162. Timiri Nagasuram (wind instrument). Madras.
 '78-163. Hanumanta Ottu (wind instrument). Madras.
 '78-164. Horn. Moorshedabad.
 '78-165. Kettle drum. Bengal.

CLASS A^{III}.

TOPOGRAPHY ; MAPS.

A series of maps illustrative of Indian surveys.

- '78-166. Relief map of India (small size, colored).

CLASS A^{IV}.

PEOPLE OF INDIA.

- '78-167. 24 frames, containing photographs of the Races and Tribes of Hindustan. (These photographs form a portion of the illustrations from the work on the People of India, by J. Forbes Watson, M. A., M. D., LL. D., and Sir John W. Kaye, F. R. S., 8 vols., sup. roy. 4to. 2l. 5s. per vol. W. H. Allen, London.)

DEPARTMENT IV.—ART.

CLASS A^V.

CARVINGS IN WOOD, IVORY, ETC.

- '78-168. Carved black-wood model of Buman Chuttree, a place where attendants seek shelter when the bodies of the dead are being burned. Booj, Kutch.

- '78-169. Carved sandal-wood model of Hindoo temple (Kullyanee-shion). Booj, Kutch.
- '78-170. Carved black-wood vase. Bombay.
- '78-171. Idol, carved wood (Vishnu riding on Garuda). Madras.
- '78-172. Idol, carved wood (Vishnu). Nepal.
- '78-173. Idol, carved wood (Chandra). Nepal.
- '78-174. Carved pith figure. Barber. Trichinopoly.
- '78-175. Carved pith figure. Birdseller. Trichinopoly.
- '78-176. Carved pith figure. Shoemaker. Trichinopoly.
- '78-177. Carved sandal-wood glove box. Bombay.
- '78-178. Carved sandal-wood fan. Bombay.
- '78-179. Carved ivory box. Burmah.
- '78-180. Carved elephant with howdah. Burhampore.
- '78-181. Carved horn tazza. Gokah.
- '78-182. Carved horn drinking-cup. Rutnagherry, Bombay.

CLASS A^{VI}.

INLAID WORK IN WOOD, METAL, ETC.

- '78-183. Glove box. Bombay.
- '78-184. Work box. Bombay.
- '78-185. Pair of inlaid sandals.

NOTE ON INLAID WORK.

This work, according to Framjee Heerjeebhoy and other craftsmen of the trade, was imported into Bombay from Persia through Scinde, and it seems, from inquiries made by Dr. Birdwood on a previous occasion, that they all agree in naming Shiraz as the place from which it emanated. Three Mooltanees, Devidas and Vulleeram, brothers, and Pershotum Heeralal, were the first, it would seem, who settled about a hundred years ago in Scinde. Kuntaree or Soortee people acquired the art under them, and came to Bombay about sixty years ago, from whence they spread to Surat, Baroda, and other places. The trade now is merely imitative, new geometrical combinations are seldom thought of; the workers content themselves with simply copying the forms which were imported from Persia. Manorodas, Nundlal, Lalchund, Thawurdas, Ruttonjee, Pranvulubh, and Narrondas are said to have been the first who introduced the work into Bombay. A number of Parsees and Soortees have since been educated by them. Dr. Birdwood gives a list of fifty shops now carrying on the business in Bombay, giving employment to about a hundred and twenty people.

This work is composed of the following materials:—Ivory, which is always white; Samber Horn (Sawursing), which is always green; the color is produced by steeping it in verdigris dissolved in lemon juice, toddy, or vinegar.

Sandal-wood used in its natural color.

Ebony, on account of its color.

Pattung—Sappan-wood—according to Dr. Birdwood “the wood of *Cæsalpinia Sappan*.” This wood is of a rich burnt sienna color, and seems to have been unknown to the Persian workers, as vermilion is substituted for it.

Mineral—Tin (the Persians use brass instead), in imitation of silver. This is generally purchased round, and passed through a roller known by the name of Rat, the lower wheel of which is cut in several places, forming more or less acute angles, the upper wheel being smooth; the tin issues from it in a triangular shape. This and all the other materials partake of the shape of the square, the rhombus, the isosceles, equilateral and right-angle triangles. Segmental forms are sometimes given to the ivory, sandal-wood, and ebony filling in ground, so as to admit of circular designs. The tin employed is sometimes round when used as a border, and is then known as “Ekdani,” which means one line, and forms a succession of round dots. The sandal-wood is never introduced in borders, but is employed in the larger patterns; the materials are glued together into various geometrical forms, consisting of circles, hexagons, the square, the rhombus, and the triangle; the glue usually used in preference to all others is Ahmedabad glue, which is considered by native workers stronger than any manufactured in the country or imported from Europe. It is dissolved in brandy or spirits of wine. The length of the pieces glued together is generally two feet, and these are sawn off in sections with delicate saws in widths varying between the 15th and 10th part of an inch. These are glued on to sandal-wood about a quarter of an inch thick, the latter is fastened on to black-wood (Sisso), teak-wood (Saag), or deal (Deodar). Not unfrequently the whole box is made of sandal-wood, but this adds materially to the expense. Some of the designs are known under the name of—

Mhotee Kutkee-no-gool—A design of comparatively large hexagons. The prefix Kutkee is applied to the work when sandal-wood and ebony are introduced.

Adhee Dhar-no-gool—The rhombus.

Tun Dhar-no-gool—The triangle.

Chorus-gool—The square or matting pattern.

Gool—Round.

Poro Hansio, Jaffran Marapect, Sankro Hansio, Lehero, Jeri, Ekdani, and Baelmootana are names applied to borders.

A cheap white wood known as “Dooblo” has been tried as a substitute for ivory, but its use has been discontinued, as it does not answer; it is, however, still used in the Ceylon inlaid woodwork.

'78-186. Card basket of porcupine quill work. Vizagapatam.

'78-187. Box of porcupine quill work. Vizagapatam.

'78-188. Casket of Koftgari ware. Sealkote.

'78-189. Basket of Koftgari ware. Sealkote.

Process of Manufacture of Koftgari Ware (Steel inlaid with Gold).—The pattern on the steel is engraved by the hand with a fine-pointed tool called

"cherma." The golden is beaten out into a very thin wire, which is laid into the design so engraved. The surface is next scraped to an exact level, by an instrument called "Tor" or "Silat." The article is then exposed to a moderate amount of heat, and when taken from the fire is rubbed and polished with a smooth stone called "mohari" (Punjab Catalogue). Koftgari work is produced chiefly in Goojerat and Sealkote, in the Punjab, that of the latter place being distinguished by higher finish. It was formerly much in vogue for the decoration of arms, but as the manufacture of arms has been generally discouraged since the rebellion in India, its application is chiefly confined to the ornamentation of fancy articles, such as paper-knives, paper weights, jewel caskets, etc.

CLASS A^{vii}.

PAINTINGS ON IVORY, LEATHER, MICA, ETC.

- '78-190-2. Three writing pads of ornamental painted leather.
Kurnool.
- '78-193. Paintings on mica (in frame). Trichinopoly.
- '78-194 204. Eleven samples of Calligraphy or ornamental writing
in colors. India.

DEPARTMENT V.—MACHINERY.

CLASS A^{viii}.

MODELS OF BOATS.

- '78-205. (Bhar.) For heavy cargo. Calcutta.
- '78-206. (Hudi.) Used in coasting about Chittagong. Calcutta.
- '78-207. (Balam boat.) Deep-water passenger boat. Calcutta.
- '78-208. (Budgerow.) Passenger boat. Calcutta.
- '78-209. (Mayur Panki.) Peacock-prowed boat. Calcutta.
- '78-210. (Khega Dhangi.) Ferry boat. Calcutta.

DEPARTMENT VI.—AGRICULTURE.

ARBORICULTURE AND FOREST PRODUCE.

CLASS A^{ix}.

DYE-WOODS.

India produces a large variety, and amongst them the most valuable of organic materials for the use of the dyer. Those which are not indigenous have been introduced with success, and when we name indigo, cutch, madder, sappan wood, safflower, mangrove bark, nut-galls, myrabolams, and many others, it will be judged that the "Empire in the East" has great resources in dye stuffs. The collection given is neither large nor numerous, but it is useful as an indication of the resources at command.

- '78-583. Sappan wood. *Cæsalpinia sappan*.
- '78-584. Wood of *Morinda tinctoria*. Madras.
- '78-585. Jack wood. *Artocarpus integrifolia*.
- '78-586. Cutch wood. *Acacia catechu*. Shahjehanpore.
- '78-587. Avaram bark. *Cassia auriculata*.
- '78-588. Bark of *Cassia fistula*. Cuttack.
- '78-589-90. Two samples of mangrove bark. *Rhizophora sp.*
Burmah and Singapore.
- '78-591. Aroogay bark. Madras.
- '78-592. Sambooram. Sindh.
- '78-593. Babool. *Accacia Aribica*.
- '78-594. Pupli. *Tentilago Maderaspatam*. Madras.
- '78-595. Chay root. *Hedyotis umbellata*. Nangpore.
- '78-596-7. Two samples Aal root. *Morinda citrifolia*. Central India.
- '78-598-600. Munjeet. *Rubia cordifolia*. Nepal, Assam, and
Bengal.
- '78-601. Munjeet. *Rubia munjista*. Bombay.
- '78-602. Madder. *Rubia tinctoria*. Madras.
- '78-603-6. Four samples of tumeric. *Curcuma longa*. Dehra-
Doon, Bombay, Bengal, Bimlipatam.
- '78-607. Sample of round turmeric. *Curcuma longa*. Madras.

- '78-608. Sample of Bengal turmeric. *Curcuma longa*. Calcutta.
 '78-609. Sample of ground turmeric. *Curcuma longa*.
 '78-610. Mara munjil. *Cosciniun fenestratum*.
 '78-611. Rutanjot. *Onosma echiodes*. N. W. Provinces.
 '78-612. Green dye. *Jatropha*. Malda.
 '78-613. Henna. *Lawsonia inermis*.
 '78-614. Usberg. *Delphinium* sp. Lahore.
 '78-615. Sumac. *Rhus* sp. Cawnpore.
 '78-616. Dhawa flowers. *Grislea tomentosa*. N. W. Provinces.
 '78-617. Palas flowers. *Butea frondosa*. Burmah.
 '78-618. Palas flowers. *Butea frondosa*. Ahmednugger.
 '78-619-26. Eight samples of safflower. *Carthamus tinctorius*,
 from Indore, Burmah, Hydrabad, Hooghley, Moorshe-
 dabad, Sarum, Dacca, Ahmednugger.
 '78-627. Ball safflower. *Carthamus tinctorius*.
 '78-628. Hursingar. *Nyctanthus Arbor tristis*. Madras.
 '78-629. Divi Divi. *Cæsalpina coriaria*. Cawnpore.
 '78-630. Marking nuts. *Semecarpus anacardium*. Burmah.
 '78-631. Kamala. *Mallotus Philippinensis*.
 '78-632. Aomla. *Embllica officinalis*. Bombay.
 '78-633-5. Three samples of myrabolams. *Terminalia chebula*.
 Bombay, Calcutta, Bengal.
 '78-636. Beleric myrabolams. *Terminalia belerica*. Madras.
 '78-637. Crushed myrabolams. *Terminalia chebula*. Cawnpore.
 '78-638. Usneh. *Parmelia perlata*. Umritser.
 '78-639. Chulcheleera. *Parmelia Kamtschadalis*. Bengal.
 '78-640. Orchella. *Roccella fuciformis*. Travancore.
 '78-641. Mochurrus. *Areca catechu*. Bombay.
 '78-642. Blue galls of *Quercus infectoria*.
 '78-643. Galls of *Terminalia chebula*.
 '78-644. Tamarisk galls. *Tamarix furas*. Bombay.
 '78-645. Pulas kino. *Butea frondosa*.

CLASS A^x.

GUMS AND RESINS.

- '78-646-50. Five samples of sal dammar. *Shorea robusta*, from
 Central Provinces, Raepore, Gyah, Burmah, Chota,
 Nagpore.
 '78-651-5. Six samples of black dammar. *Canarium strictum*,
 from Madras, Coorg, Salem, Burmah, and Cochin.

- '78-656. Pwai Nyet. *Canarium strictum*? Burmah.
- '78-657. Thingan. *Hopea odorata*. Pegu.
- '78-658. Resin. *Hardwickia binata*. Salem.
- '78-659. Dhoop resin. *Vateria Indica*. W. India.
- '78-660-3. Five samples of piney resin. *Vateria Indica*, from Mysore, Bangalure, Madras, Travancore.
- '78-664. Salai. *Terminalia* sp. Berar.
- '78-665. Olibanum. *Boswellia Bhadagiana*. Bombay.
- '78-666. Myrrh. *Balsamodendron myrrha*. Bombay.
- '78-667. Jalmaram incense. Salem.
- '78-668. False Benzoin. *Terminalia argustifolia*. Bombay.
- '78-669. Muttipal. *Ailanthus Malabarica*. Bombay.
- '78-670. Dika Mali. *Gardenia gummifera*. S. India.
- '78-671. Asafetida. *Narthex asafetida*. Bombay.
- '78-672. Two samples of Mysore gamboge. *Garcinia pictoria*. Bombay.
- '78-673. Palas Kino. *Butea frondosa*. Central Provinces.
- '78-674. Banapu. *Terminalia tomentosa*. Madras.
- '78-675. Kino, inferior. *Pterocarpus marsupium*. Madras.
- '78-676. Kino. *Pterocarpus marsupium*. Madras.
- '78-677. Vengayggum. *Pterocarpus marsupium*. Madras.
- '78-678. Khaira. *Sterculia urens*. Indore.
- '78-679. Karree gum. *Sterculia urens*. Central Provinces.
- '78-680-1. Two samples of Kuteera gum. *Sterculia urens*, from Berar and Madras.
- '78-682. Kuteera. *Cochlospermum gossypium*. Madras.
- '78-683-4. Two samples of Babool gum. *Acacia Arabica*, from Baroda and Central India.
- '78-685-8. Four samples of Babool gum. *Acacia Arabica*, from Calcutta, Gyah, Salem, and Central Provinces.
- '78-689. Kheir. *Acacia catechu*. Madras.
- '78-690-2. Three samples of Kheir gum. *Acacia catechu*, from Central Provinces, Goonah, Chutterpore.
- '78-693. Caroo Velai. *Acacia* sp. Madras.
- '78-694. Velai gum. *Acacia leucophlea*. Madras.
- '78-695. Sella Woonga. *Acacia odoratissima*. Salem.
- '78-696. Gum of *Melia azadarach*. Salem.
- '78-697. Wood-apple gum. *Feronia elephantum*. Madras.
- '78-698. Woodier gum. *Odian wodier*. Central Provinces.
- '78-699-700. Two samples of woody gum. *Odina wodier*, from Bengal, N. W. Provinces.

- '78-701. Dowra, *Conocarpus latifolia*. Ahmedabad.
 '78-702. Kuthlia gum. Indore.
 '78-703. Veckale. *Conocarpus latifolia*. Madura.
 '78-704-5. Two samples of Dinduga. *Conocarpus latifolia*, from Salem and Madras.
 '78-706-7. Two samples of Dowra. *Conocarpus latifolia*, from Goonah and Central India.
 '78-708-9. Two samples of Chironjée. *Buchanania latifolia*. Central Provinces and Madras.
 '78-710. Gum of Chironjée. *Buchanania latifolia*. Berar.
 '78-711. Moorkalee gum. Salem.
 '78-712. Marking tree gum. *Semecarpus anacardium*. Madras.
 '78-713. Gum of *Macaranga tomentosa*. Madras.
 '78-714. Kattimandu. *Euphorbia cattemandu*.
 '78-715. Panchontee. *Bassia elliptica*. Madras.
 '78-716. Coorta gum. Source uncertain.
 '78-717. Gutta percha. *Isonandra gutta*. Malacca.

These products have as yet not been fairly and completely sought out and developed in India. The supply could doubtless be very large, but so long as indiscriminate mixing and careless collection is the rule rather than the exception, the gums and resins of Indian forests will fail to secure a remunerative market.

- '78-718-20. Stick lac, from various parts of India and Burmah.
 '78-721. Cake lac. Bombay.
 '78-722. Grain lac. Mirzapore.
 '78-723. Three samples of Flake lac. Bengal.
 '78-724-5. Shell lac. Mirzapore. Bengal.
 '78-726. Silk lac. Jubbulpore.
 '78-727. Seed lac. Mirzapore.
 '78-728. Seed lac. Central India.

Stick lac consists of the resinous incrustation formed by the female lac-insect upon the small branches of various trees and shrubs, being found abundantly throughout most of the forest districts of India and Burmah.

AGRICULTURAL PRODUCTS.

CLASS A^{xi} AND A^{xii}.

FOOD GRAINS. CEREALS AND PULSE.

- '78-729-35. Fifteen samples of wheat (*Triticum vulgare*) from Sind, Punjab, Faridpur, Bengal, Nagpore, Madras, and Central India.

Wheat is largely cultivated in the north as a spring crop. Dr. Royle mentions that he has not seen wheat higher than 8,000 feet, but Gerard speaks of it at 10,000, and Captain Webb at 12,000, on the southern slope of the Himalaya. The extreme limit is given at 13,000 to 15,000 feet. The varieties cultivated in India are not many; white wheats are generally preferred. Bearded wheat is most commonly grown in the Deccan, Gujerat, and Khandeish. Wheat is much grown in the Burmese territories. The natives generally do not consume much of this grain, but it is reserved for sale. Wheat flour is mixed with the flour of some of the pulse, and in this form made into cakes, bread or cakes made of pure wheaten flour being too expensive a luxury for the mass of the population.

'78-736-41. Ten samples of barley (*Hordeum distichon*), from Belgaum and other places.

Barley is cultivated in the Himalayas up to 15,000 feet. There are several varieties, belonging probably to more than one species, some certainly to *Hordeum hexastichon*. The latter is said by Dr. Stewart to be frequently cultivated as a cold-weather crop in the plains of the Punjab, as it requires less labor and gives more produce than wheat, even in inferior soil, and where the water is deep below the surface. In some parts of the Himalayas, above 8,000 feet, it is much more common than wheat, while at lower levels it is less grown. In Lahoul and Ladak it is abundantly cultivated up to 13,000 feet; in the latter some kinds of barley may be seen to over 14,000 feet, about Haule, near the Tsomoriri lake. In the plains it is frequently cut two, or even three times, when young, as fodder, with little or no injury to the ear, which is formed afterward. In Lahoul, on the Sutlej, and in Ladak, a kind of beer is made from this grain, and in the latter a kind of spirit, which is used by some of the richer inhabitants. A dark purple variety of barley is cultivated near the Sutlej, and a clear translucent barley of superior quality called "paighambri." A similar naked barley is grown in Nepal.

'78-742-6. Five samples of oats (*Avena sativa*), from Patna and Monghyr.

Oats were introduced some years ago, and are now grown sparingly at Patna and Monghur, the original stations, and in one or two other localities, but beyond these does not seem to meet with favor, and the cultivation shows no tendency toward expansion. The paleaceous envelopes develop in greater luxuriance than in Europe, to the deterioration of the grain.

'78-747-8. Two samples of maize (*Zea mays*) from Northwestern India.

Maize introduced into India is now widely distributed, not only in India proper, but in Burmah, and is universally employed for human food. In the Deccan, Colonel Sykes says, that the spikes are seldom allowed to ripen; while the grain is yet soft and milky the spike is taken off. It is fried or parched, and eaten with ghee and pepper or sugar; when the Koondé and his friends cannot consume in this way the produce of a field the grain is allowed to ripen

and is ground into flour. Baden Powell observes, in his "Punjab Products," that "maize grows everywhere throughout the hills, and appears to flourish just as well in a temperate as in a tropical climate. At 7,000 feet or more, it is the favorite crop of the people, and for six months of the year forms their common staple of food. Although superseded in the valleys by rice, there is always a little plot of maize around the cottage of the peasantry which is reserved for themselves, while the rice is disposed of to wealthier classes. To the uplands maize is an admirably suited crop. It is very hardy, requires little rain, and is rapidly matured. In sixty days from the day of sowing the cobs are fit to eat, but the grain will not keep. Weevils attack it in preference to any other grain, and it is a popular saying that the life of maize is only a year long."

'78-749-50. Four samples of jowaree (*Sorghum vulgare*).

This grain is the most universally cultivated of any grain in the wet crop; it is in fact (in some parts) the principal support of man and beast. It will grow upon most soils, but luxuriates in the black soil (*Sykes*). There are several varieties, but principally one with red seeds and one with white. When grown for fodder it is much more thickly sown than when grown as a grain. As a fodder plant it is highly esteemed. A single plant found growing by itself is described by Sir John Hearsay in the Journal of the Agri. Hort. Soc. of India for 1858, which produced 12,700 seeds. Some botanists recognize at least three species in cultivation, more or less, in India, viz., the present *Sorghum vulgare*, Pers., *Sorghum cernuum*, W., and *Sorghum bicolor*, Mönch, whilst others regard these as mere varieties of the one species which is extensively cultivated over the world, and exhibits, like all largely cultivated plants, a great tendency to variation.

'78-751-7. Nine samples of bajra (*Penicillaria spicata*).

The spiked millet is as common in Africa as in Asia, at a distance bearing some resemblance to our indigenous cat's-tail mace in the form and size of its spikes. Many stems often proceed from the same root, and these are from three to six feet in height. The fruit spike is dense, compact, and thicker than a man's thumb, from six to nine inches in length (twice as long in Africa). The seeds are obovate and compressed, so that they are largest upward, almost in shape like a small grape stone, pearl colored, and smooth. Except *Sorghum*, this is the most commonly cultivated grain. Roxburgh says that "it is sown about the beginning of the rains, viz., the end of June and beginning of July, and is ripe in September. It is much cultivated over the higher lands on the coast of Coromandel. The soil it likes is one that is loose and rich; in such it yields upward of an hundred-fold; the same ground will yield a second crop of this or some other sort of dry grain during October, November, December, and January."

Colonel Sykes says that it affects a reddish light gravelly, or marly soil, but it is sown at times on the black soil. Under favorable circumstances one seed will produce eight stalks, each stalk furnished with a spike full of seed. Commonly, however, each seed produces only one or two good heads. From

a head of ripe bajree, growing by accident in the month of August in a field of kodra, I obtained 2,120 perfect seeds. Supposing, therefore, eight heads to each plant, there would be 16,960 seeds, and the plant will commonly average 8,000 seeds. From a field of bajree, reaping of the 27th September, the plants average four stalks each, each stalk with a spike of 2,175 seeds, or a return of 8,700 for one. One plant had ten stalks and fifteen heads of grain.

The stalk is almost useless as fodder when dry but cattle are sometimes fed with it when green. The seeds are considered rather heating, and are used in cold weather mostly as flour. Although in Africa a kind of beer is said to be made from the malted grain, we have no record of such use being made of it in India.

'78-758-68. 15 samples of Italian millet (*Setaria Italica*).

This is considered by the natives one of the most delicious of cultivated grains. It is cultivated in many parts of India, and delights in a light, elevated, tolerably dry soil. The seed time for the first crop is June-July; and harvest in September. A second crop may be had from the same ground between September and the end of January. Dr. Roxburgh states that it produces about fifty-fold in a favorable season. Dr. Ainslie writes: "This small round grain is much prized by the native Indians of all descriptions, who make cakes of it, and also a kind of porridge; for the purposes of pastry it is little, if at all, inferior to wheat, and when boiled with milk it forms a light and pleasant meal for invalids. The Brahmins hold it in high estimation—indeed, more than any other grain." In the Punjab, Baden Powell states that "this grain is much used for feeding poultry, etc. It is very little used as food otherwise; it is nutritious, but it is said to be heating, and apt to produce diarrhoea." This grain is commonly cultivated in the Himalaya, occasionally up to 6,500 feet. At places on the Chenab the leaves are used as a pot herb.

'78-769-76. 9 samples of millet (*Panicum miliaceum*).

'78-777. Sample of millet. Madras.

'78-778. Sample of millet. Faridpur.

'78-779. Sample of millet. Cuttack.

This grain is extensively cultivated in most parts of India. In the Deccan, Colonel Sykes reports that it "is sown in June-July by hand, is sometimes transplanted, requires weeding in August-September, and is reaped in November-December. In crops not weeded the return was only twelve to one, but in good seasons, and well weeded, the return would be eighteen for one. The grain is cut down with the 'yela,' tied up in sheaves, and trodden out by bullocks. The straw is eaten by cattle whilst a little grain remains in it." At Kundalleh, Colonel Sykes intimates that the yield was far greater, being equal to 192 seers for 4 seers of seed, or 48 for 1.

Dr. Stewart reports that it is common in many parts of the Himalaya up to the Indus, being most common from 3,000 up to 8,000 feet (at places on the Chenáb). It is also grown at 10,000-11,000 feet in Ladák. Its grain is considered digestible and nutritious, and in some parts is mostly consumed unground.

'78-780-7. 10 samples of little millet (*Panicum miliare*).

This millet is by no means extensively cultivated in India. It is known as *Kutki* in the Punjab, but is sparingly grown. In its uses it does not differ from the Italian and Indian millets, but is far less known.

'78-788-98. 15 samples of Sawa millet (*Oplismenus frumentaceus*).

Dr. Roxburgh says briefly of this plant that he had "only found it in a state of cultivation. It delights in a light, tolerably dry, rich soil; the same ground yields two crops, between the first of the rains in June and July, and the end of January. The seed is wholesome and nourishing; it is an article of diet, particularly amongst the lower classes of the natives, and yields about fifty-fold in a good soil. Cattle are fond of it."

In a letter to the Agri. Hort. Soc. of India, Mr. C. B. Taylor strongly recommends this grain as being much cheaper and better than maize. "It is light and easy of digestion, it makes very palatable puddings, which children appear more partial to than those made of rice, to which grain, when boiled, it bears a striking resemblance, both as to taste and in appearance." This grain is much less cultivated than *Panicum miliaceum*.

'78-799-808. 15 samples of Koda millet (*Paspalum scrobiculatum*).

This is a very common and cheap grain, grown to some extent in most parts of India. Dr. Roxburgh writes of it that it delights in a light, dry, loose soil, but will grow in a very barren one. It is cultivated in the rainy season. The seed is an article of diet with the Hindoos, particularly with those who inhabit the mountains and most barren parts of the country, for it is in such countries only where it is cultivated, it being an unprofitable crop, and not sown where others more beneficial will thrive. It is a very common belief that this grain is unwholesome; this was mentioned by Dr. Ainslie, and has since been often repeated. Dr. Gibson says that "a variety of it called Hurreek often induces temporary insanity and spasms, etc. Large numbers of people may occasionally be seen thus affected." Dr. Stewart writes that in the Bij-nour district this grain "is said to produce cholera and vomiting, and I find that some authors mention a similar phenomenon as occasionally occurring in all three presidencies. The natives generally hold that with the ordinary koda, and undistinguishable from it, grows a kind they call majna or majni, which produces the above effects, but it has been with greater probability suggested that these depend on the use of the new grain under certain conditions. These results, however, cannot be common here, as a very intelligent old gentleman of the district informed me, that he had never seen a case."

'78-809-22. 20 samples of raggee (*Eleusine caracana*).

This grain is of great importance to the poor, from its hardness, and from the abundant return it gives. The best method of cultivation is that which is

pursued with rice, but it does not require a similar quantity of water, and is planted on spots which the farmers have not thought it advisable to appropriate to rice. It will grow on almost any soil, but the return will be proportioned to the quality of the soil and to the attention bestowed on the cultivation. (*Sykes*.)

The seeds are usually ground into flour by the handmill, this being chiefly a bread grain. The straw, though tough, is employed as fodder, and cattle seem to be fond of it, especially horses, which will even prefer it to any other kind of dry forage. In the south this grain is very largely cultivated, and it extends north, over the Punjab plains to the Himalaya, where it is pretty frequent as far west as the Chenab up to 6,000 and 7,000 feet.

'78-823. 1 sample of buttee (millet). (*Panicum sp.*) Amedabad.

'78-824. 1 sample of ralee (millet). (*Panicum sp.*) Amedabad.

'78-825. Bamboo seed (*Bambusa arundinacea*). N. W. P.

Bamboo grain has considerable resemblance to oats, and is collected in some localities as food by the poorer classes in times when other food grains are scarce and dear. Mr. Blechynden, in a letter published in Agri. Hort. Soc. of India Journal, gives particulars of the service rendered by this grain after failure of the rice crops, in Orissa, in 1812, when a general famine was apprehended. "The grain obtained from the bamboo was most plentiful and gave sustenance to thousands; indeed, the poorer, and therefore the greater portion, of the inhabitants subsisted for some time solely on this food. So great was the natural anxiety that was evinced to obtain the grain, that hundreds of people were on the watch day and night, and cloths were spread under every clump to secure the seeds as they fell from the branches."

'78-826-30. 5 samples of raggera (*Amaranthus frumentaceus*).

Dr. Wright writes of this species that it is much cultivated on the slopes of the higher hills in several districts of Southern India. In Coimbatore, Salem, and Madura, he had frequently met with large fields of it, often on very steep slopes. In such situations it often grows upward of six feet high. The seed ground into meal forms the principal food of the wild inhabitants of the hills. Several species of *Amaranthus* are found in the hilly districts of Northern India, where the leaves are eaten as a vegetable and the seeds as grain. Dr. Jameson mentions two species cultivated at Kullá.

'78-831-2. 3 samples of buckwheat (*Faopyrum esculentum*), from the Himalayas.

This food grain, said to have been originally brought from Central Asia, is found sparingly cultivated in the Himalayas. It grows at about 6,000 feet, according to Dr. Stewart, on the Jholam; 5,000 to 10,000 on the Chenab and Ravi; 8,000 to 9,000 on the Bías; and on the Sutlej it is grown commonly to 11,500; Gerard states that he has seen it at 13,600 feet. Thomson notes it at 13,000 feet in Zanskar; and Cayley mentions it as cultivated to 14,000 feet in Ladak, where Dr. Stewart saw it to over 13,500. In Lahoul, Aitchison says

that the leaves are much used as a pot herb in summer, when other greens are not easily got. One or two other species are believed to be cultivated in the same region for the same purposes. Buckwheat is occasionally seen as a cultivated product in the Deccan, the grain being eaten toasted as a fast-day food by the Hindoos.

'78-833. Samples of quinoa (*Chenopodium quinoa*, portion of seed dispatched to India for experimental cultivation on the slopes of the Himalayas).

'78-834. Soojee flour. Madras.

'78-835. Tapioca flour (*Jatropha manihot*).

'78-836-7. Tapioca (2 samples) (*Jatropha manihot*).

'78-838. Pearl tapioca (*Jatropha manihot*).

'78-839-41. Arrowroot (3 samples) (*Maranta arundinacea*).

'78-842. Arrowroot (*Curcuma augustifolia*).

'78-843. Imitations sago (*Tacca pinnatifida*).

'78-844. Rice (*Oryza sativa*). 25 samples. Bengal.

'78-845. Rice (*Oryza sativa*). 10 samples. Burmah.

'78-846. Rice (*Oryza sativa*). 5 samples. Central Provinces.

'78-847. Rice (*Oryza sativa*). 5 samples. Northwest Provinces.

'78-848. Rice (*Oryza sativa*). 10 samples. Madras.

'78-849. Rice (*Oryza sativa*). 10 samples. Punjab.

'78-850. Rice (*Oryza sativa*). 5 samples. Sindh.

Oryza sativa,

of which there are innumerable varieties, is the favorite food-grain of the people, but with the exception of Arracan, and a few other districts in which it constitutes the chief and almost only article cultivated, its use is confined to the richer classes throughout the country. It grows readily on low lands, which are well irrigated, heat and moisture being the two great essentials for its development. There are three modes of culture: The first and simplest consists in sowing the seed broadcast in its natural state. In unirrigated land this method is universally followed. In the second, the seed is steeped and then forced under warm grass to germinate. The seed with the tender shoots is then thrown into the soil, which has previously been flooded to receive it. This method prevails wherever water is abundant. In the third the crop is raised in a nursery, and when about a month old the young plants are planted out at stated intervals, in a well-flooded field. This system of transplanting involves a great deal of trouble, and is only followed in heavy, swampy ground where the plough cannot work, although by it the yield of rice is greater than by any of the other methods. These modes of cultivation are followed in the Kangra Valley, in which the celebrated "básmati" rice is grown. Another celebrated variety is the "vara," or scented rice, which is grown exclusively on lands irrigated by the river Bara, in the Peshawur Valley. The rice crop is sown in May or June and reaped in October.

Very many varieties of rice are grown in Oude. A heavy soil and plenty of water suits them best. There are five kinds which are considered among the best. "Mihee" and "Bansee" are foremost. The peculiarity in the cultivation of these two kinds is, that they are transplanted and placed about five inches apart. And by this method, if the soil is good, they grow to the height of an ordinary-sized man, and produce a much larger quantity than if otherwise treated. The odor and flavor of these two kinds, when cooked, are superior to those of any other kind. They are only used by those who can afford to buy them.

As the labor in cultivating them makes them dearer than the other sorts, the three other varieties which are considered good are the "Bateesa," the "—," and the "Phool-Biring." They are sown broadcast in June and left so, and they are the kinds mostly used by natives. The first two mentioned, when new, sell for 10 or 12 seers per rupee, and become dearer according as they become older. The other three kinds sell for about 19 seers per rupee, and are dearer if older. Some consider "Phool-Biring" the best, as it swells in boiling, and has an agreeable odor.

- '78-851. Paddy. 25 samples. Bengal.
- '78-852. Paddy. 20 samples. Burmah.
- '78-853. Paddy. 10 samples. Madras.
- '78-854. Paddy. 19 samples. Bombay.
- '78-855. Paddy. 2 samples. Sindh.
- '78-856. Paddy. 4 samples. Punjab.
- '78-857. Paddy. 3 samples. Cashmir.
- '78-858. Paddy. 2 samples. Oudh.
- '78-859-71. 15 samples of Cajan pea (*Cajanus Indicus*).

There are numerous varieties of this pea, which is most extensively grown in almost all parts of India. It is sown in the fields at the commencement of the rains in June, and is ripe in December. The young and green pods are used as a vegetable. The seed is split to form Dál, and is used in soups; or it is parched, especially the black variety, or it is ground into meal and mixed with wheat flour made into cakes. The leaves and pods, after the seed is removed, are used as fodder. Sir Walter Elliot says that this pulse when split is in great and general esteem, and forms the most generally used article of diet among all classes. It is chiefly eaten mixed with rice, a mess known as "khichri," vulgo "kedjari." Roxburgh assigns to it a comparative value in native estimation after *Phaseolus radiatus*, to which he gives the first place, and *Cicer arietinum*, or Chick pea, which he reckons the second. But as far as the general and daily use of the several kinds may be taken as an indication of taste, the *Cajanus*, or pigeon pea, must be considered as number one.

- '78-872-81. 15 samples of Chick pea (*Cicer arietinum*).

The Chick pea is largely cultivated, and much esteemed in India as an article of diet, and also as food for cattle. There are three distinct varieties,

according to the color of the seed—the white seeded, the brown seeded, and the black seeded. The latter appears to be by no means common. The natives use the seeds parched and ground, mixed with wheat flour. Split, it constitutes one of the Dáls. The green grain eaten raw is called Solaneh. The haulm is used as fodder. Colonel Sykes examined a middle-sized plant collected at Gunnelgoon, and found upon it 116 fine pods, some containing three, others two, and some one seed, altogether 170 seeds. This pulse does not appear to be much cultivated in the hill tracts of the North. Barnes says a belief is current in the hills that “there is some affinity in the grain field “which attracts the lightning, and after a storm he had certainly observed “whole tracts scorched and destroyed as if by fire.” Some attempts have been made to grow gram in Britain, but the climate does not seem to be suitable for the perfection of the seeds in ordinary seasons, although ripe seeds have been produced. Fine large-seeded varieties are grown in Spain.

'78-882-6. 5 samples of pea (*Pisum sativum*).

'78-887-91. 5 samples of common pea (*Pisum arvense*).

The gray field pea is common in India. In the Deccan, Colonel Sykes states that it is sown in October by the hand, and brought to perfection by the dews in January or February.

Peas are used precisely in the same manner as gram, with the exception of their not being given to horses, and not being made into Lashoo (a kind of Dál pudding). The haulm and remains of the pods are considered good fodder for cattle. The Mahrattas distinguish three kinds, the gray seeded, dark seeded, and white seeded. Although it is generally supposed that our common peas originated from a Mediterranean stock, the small gray Himalayan pea of Lawson's “Synopsis” is there cited as the probable origin as follows:

“Its seeds were sent from Himalaya under the name of Kullao, and being from a district of Asia which is supposed to have produced many others of our most useful cultivated plants, it is not improbable but that it may be the origin from which all the improved varieties of the pea at present in cultivation have been derived.”

'78-892-6. Lentils, 5 samples (*Ervum lens*).

This pulse is widely but not largely cultivated in India, where it is eaten either boiled whole, or split and used as other split pulse are used. In Northern India it is also ground and mixed with flour. The legumes are eaten green as a vegetable.

In Southern India the return in cultivation is reckoned as thirty for one. Dr. Stewart believes that he has seen it growing as high as 5,000 feet on the Chenab, and it is cultivated in parts of Ladak to 11,500 feet.

'78-897-900. Kessaree, 5 samples (*Laihyrus sativus*).

This Chickling vetch is cultivated in various parts of India, where it is used as food, chiefly as Dál. It will be remembered that Duvernoy ascribed such pernicious qualities to this pulse, as causing rigidity of the limbs, delirium, and other dreadful effects to such an extent that the Duke of Wurtemberg, in 1671, prohibited its use by edict, which was confirmed by his successors. In

the recent Pharmacopœia of India attention was called to this plant in a special note, because "the continued use of its seeds as an article of diet is apt, under certain circumstances, to induce paralysis of the lower extremities. In one district in Bengal nearly 4 per cent. of the population were sufferers from it."

'78-901-9. Wall or Nankin bean, 15 samples (*Lablab vulgaris*).

Of this there are numerous varieties, and it is found both wild and cultivated, chiefly in the southern part of India. The pods are eaten green as a vegetable, the seeds are split for Dál and are eaten by the poorer classes, especially when rice is dear. The remains of the plant are used as a fodder for cattle. Dr. Ainslee remarks that this pulse "constitutes the chief part of the food of Lascars on shipboard; and the Sepoys, in making long marches, often carry it ready boiled in their knapsacks."

'78-910-21. Chowlie, 15 samples (*Dolichos sinensis*).

This is a very variable plant both in flower and seed, the latter being white, red, dun, brown, black, etc., and also varying very much in size. It is at any rate extensively cultivated, and the seeds are used as Dál, or ground up and mixed with other grains as flour. The green legumes are eaten as a vegetable.

'78-922-36. Horse gram, 20 samples (*Dolichos uniflorus*).

The flat, almost lenticular seeds of this gram are so peculiar that they are easily recognized. The plant is extensively cultivated in Southern India, where it is known as horse gram, from its forming the staple food of horses and cattle. The poorer classes also employ it as a Dál in their soups, etc. It is rather a free producer, Colonel Sykes having in the Deccan counted 309 seeds from a moderate-sized plant. Roxburgh observes "that in a good soil and favorable year the produce will be sixty-fold." In the Himalaya Dr. Stewart notes that it is commonly cultivated for its pulse up to 7,000 feet or more. It is a very useful plant, since it will grow in a very meagre soil.

'78-937-9. Burbutti, 3 samples (*Dolichos catjang*).

This pulse is grown alike in fields and gardens, and is eaten dry or green. The young pods are esteemed as a vegetable, and the ripe seeds are split as Dál, and used in soups and in other ways. As this is a strong climber it yields a considerable return, flowers and legumes being produced successively as the plant continues to grow. It is difficult to make accurate, or even approximate estimates, of the relative cultivation of these plants, but it seems to be true that this is not so much cultivated for its pulse as the allied species *Dolichos sinensis*. Whether botanically they are really distinct species, as some doubt, is not important economically, only that the two are so often confounded, and the names applied interchangeably to the seeds in collections sent to Europe, that it is difficult to ascertain localities for each form separately. It is the *Pee-yan* of Pegu.

'78-940. Horse bean (*Faba vulgaris*).

The common field bean or horse bean of Britain is rare in India, but it seems to have been cultivated in a few localities, especially in the north of

India, although not of much repute. Its Hindustani name is *Bakla*, and in the Punjab it is known as *Chastang*, modified in Ladak to *Nakshan*.

'78-941. Sword bean (*Canavalia gladiata*).

It is the opinion of Sir Walter Elliot that this bean is only the cultivated form of *canavalia virosa*; the latter is found wild in almost every hedge of India, and the former is only known under cultivation. It is a perennial climber, ascending to the summit of the loftiest trees, and bearing year after year from the end of the rains, through the cold season, an abundant crop. The seeds are large and of different colors; the white-seeded is most esteemed, but there is also a red-seeded and a brown-seeded variety. The unripe pods are used as a vegetable and the seeds as a pulse.

'78-942-5. Gowar, 5 samples (*Cyamopsis psoralioides*).

This pulse is not much cultivated in fields, but is common as a garden vegetable in many parts of India. The green pods are employed as a vegetable in the same manner as "French beans." The seeds are relished by cattle, but do not enter largely into human food. The plant produces its legumes abundantly in succession as it grows, and is so cultivated that the green pods can be obtained all the year round. In the Punjab, Dr. Stewart states that it is occasionally cultivated as a hot-weather crop for its pulse, west to the Ravi, at least. The Rohtak Local Committee communicated to the Punjab Exhibition of 1864 the information that the pulse is there "made into *Dál*, to be "used principally for cattle; it is boiled in a pan, and then the grains are "rubbed and worked about with the hand till a froth arises on the mass; a little "mustard-seed oil is then added; it is given to cattle to fatten them."

'78-946-8. Kidney bean, 5 samples (*Phaseolus vulgaris*).

'78-949-58. Mutt, 15 samples (*Phaseolus aconitifolius*).

The plant is low and herbaceous, the leaves are so deeply cut as to be almost palmate. It is seldom sown alone, and ripens in November-December. Split, it forms one of the *Dáls*, and ground into flour, is used for bread and cakes by the natives, and sometimes is used mixed with wheat flour. The steeped grain is also given to cattle. The plant, after the seeds are removed, is used as fodder. Two varieties are cultivated, the white and black, in the higher provinces of India. It is commonly cultivated as a hot-weather crop all over the Punjab plains, but chiefly in the arid parts with light soil.

'78-959-70. Green gram, 15 samples (*Phaseolus Roxburghii*).

According to Sir Walter Elliot, "this is perhaps the most esteemed of all "the pulse, though not the most extensively grown. It bears a higher price, "and is more in request among the better classes, entering largely into many of "the more delicate dishes, and cakes, such as the *paparum* or relish cakes, and "those baked for religious ceremonies. Mixed with grain, it is considered to be "strengthening for horses; the straw makes good fodder for cattle." There are several varieties, distinguished by the size and color of the seeds, and the plant

has a wide distribution in India. The grain is split for Dál, or ground into meal. In the hills it is cultivated up to 6,500 feet. There has been, and still is, considerable confusion of this species with the *Phaseolus mungo*, and *P. max*, so that it is difficult to determine in many cases which is really intended, and the native names alike seem to partake of this uncertainty, and therefore give very little help toward the determination of species in the absence of specimens.

'78-971-8. Moog or mungo, 10 samples (*Phaseolus mungo*).

"Moog is sown," says Colonel Sykes, "with the first fall of rain in fields by itself; in favorable seasons it attains the height of two feet. It succeeds very well in a stony soil, and is frequently sown on lands at the base of the low hills, and on the table-land above, where the soil is not to be seen from the multitude of stones on the surface. In a small field, planted near a well, and occasionally watered, I counted 62 legumes on one plant, with from 7 to 14 seeds in each. The average of 10 seeds to a legume would give a return of 620 for one. The remains of the plant and legumes, when the seeds are beaten out, make excellent fodder for cattle. The grain is eaten in various ways. It is boiled whole, and eaten with salt and pepper. It is split and becomes one of the Dáls. It is parched, ground into flour, and made into balls with sugar and spices, and in this way forms food for traveling. In times of scarcity a bread is made from it. It is also used in porridge or soup. The unripe legumes are eaten as a vegetable."

It is one of the most extensively cultivated of Indian pulse up to 3,500 feet on the hills, and it is considered nutritious and digestible.

'78-211. 10 frames containing illustrations of food plants of India.

CLASS A^{xiii}.

TEA.

'78-979-86. 12 samples of orange Pekoe from Bishnath, Assam, Cachar, Dehra-Doon, Punkabaree, Kangra, Kumaon.

'78-987-91. 12 samples of flowery Pekoe from Cachar, Assam, Kumaon, Kangra, Telwarree.

'78-992-6. 10 samples of Souchong from Assam, Dehra-Doon, Kangra, Kumaon, Telwarree.

'78-997-8. 6 samples of Pekoe Souchong from Assam and Kumaon.

'78-999-1002. 9 samples of Pekoe from Assam, Bishnath, Kumaon, Telwarree.

'78-1003. Sample of scented Souchong from Kumaon.

'78-1004. 2 samples of Souchong and Pekoe ends from Kangra.

'78-1005. Samples of Mixed Black from Kangra.

'78-1006-8. 3 samples of Hyson from Kumaon, Kangra, Telwarree.

'78-1009-10. 3 samples of young Hyson from Kumaon, Telwarree.

- '78-1011. Sample of Chulan from Kumaon.
- '78-1012. Sample of rose-scented orange Pekoe from Kumaon.
- '78-1013. Sample of black Gunpowder from Kumaon.
- '78-1014. Sample of Gunpowder from Telwarree.
- '78-1015. Sample of Congou from Kumaon.
- '78-1016. Sample of Oolong Souchong. Kumaon.
- '78-1017. Sample of fine Souchong. Gurhwal.
- '78-1018. Sample of broken Pekoe sundried. Sylhet.
- '78-1019. Sample of rose Pekoe. Kumaon.
- '78-1020. Sample of curious Pekoe. Kumaon.
- '78-1021-2. 2 samples of Pouchong. Kumaon.
- '78-1023. Sample of Black Tea. Neilgherries.
- '78-1024. Sample of Imperial. Telwarree.
- '78-1025. Sample of Telwarree mixture. Telwarree.
- '78-1026. Sample of tea buds. Silcoorie.

COFFEE.

- '78-1027-31. 15 samples of coffee from Aden, Bombay, Tinnevely, Paradise Estate, and Chittagong.
- '78-1032. Sample of coffee berries from South India.
- '78-1033. Sample of plantation coffee from Coorg.
- '78-1034-6. 3 samples of pea-berry coffee from Coorg, Tinnevely, and Mysore.

The coffee berry is being extensively cultivated in the highlands of Southern India, and large tracts of country are available for the extension of its growth.

SPICES.

Spices are very extensively employed in the cooking operations of Oriental nations, including many which are scarcely known in that character in the West. This is the case especially with carminative seeds, such as coriander, carraway, etc., which we are not accustomed to see in company with mustard and pepper, but are associated with them in the Asiatic *cuisine*.

- '78-1037-42. Pepper, white and black ; six samples (*Piper nigrum*).
Bombay, Travancore, Oudh, Bengal, Penang.

Consists of the dried berries of a climbing plant, which is indigenous to the forests of Malabar and Travancore. The pepper vine is propagated from cuttings or suckers, laid down at the commencement of the monsoon, in a rich and tolerably moist soil. In three years it begins to bear, each plant yielding on an average $1\frac{1}{2}$ lbs. of pepper per annum. The crop is gathered in March and April. The fruit is plucked when not quite ripe, and dried on mats in the sun. White pepper differs from black only in being deprived of the outer

skin by a short maceration in pure water, and subsequent gentle rubbing. In North Canara it is most successfully grown *above* the Ghauts, although it succeeds well below. An acre of land will bear 2,500 plants, and as they require little care, the cost of cultivating and bringing into bearing one acre does not exceed 40 rupees at the most, and as the annual yield when the plants come into bearing is worth upward of 800 rupees, the investment is a very profitable one.

'78-1043. Long pepper. Bombay.

'78-1044-5. Red pepper, two samples. Indore and Dehra-Doon.

'78-1046-54. Mustard, ten samples (*Sinapis sp.*). Berar, Maunbhoom, Sarun, Chittagong, Oudh, N. W. Provinces, Punjab, Sind.

The seeds of several species or varieties of *Sinapis* are employed in India. It is scarcely possible to determine the species or varieties from the seeds themselves, hence they are grouped together under the above general heading. Probably a large proportion may be referred to *Sinapis juncea*. Oil is also expressed from these seeds to a considerable extent, and they appear again under the heading of *Materia Medica*.

'78-1055-8. Ginger, five samples (*Zinziber officinalis*). Oudh, Bengal, Rajshahye, C. India.

The following account of the cultivation of ginger has been received from the Hill States adjoining the Ambalah district. Ginger is principally produced in Mahúr Mássá, Patrú, Dárrá, Kothi, Kotahi, Bágal, and Jayál. The best pieces of last year's harvest are selected and placed in the corner of a house in the month of Phágan; the heap is then smeared over and covered with cow-dung to keep the roots from drying up in Hár month; when the first rain falls they plough up the land two or three times; they divide the land off into beds, with a little raised edge round each bed, taking care to make openings to let superfluous water run off, for if water stands on the crop the roots will rot. They then bury little pieces of the root three inches deep in the soil at intervals of nine inches; they next cover over the field with the leaves of trees, which keeps the soil moist, and over the leaves they spread manure to a depth of half an inch; when it rains the water, impregnated with manure, filters readily through the leaves to the roots. Artificial irrigation is not employed while the rain lasts, but from Assuh to Poh it is necessary. In the month of Poh the plants are about two feet high; for every one shoot there are eight tubers or parts of the root; these are dug out and buried together in another place for a month; then they are taken out, exposed to the sun for a day, and are then fit for use.

In the months of Sawán, Bhaddon, and Assúh, three times the field is weeded. A begah of land requires eight maunds of ginger to plant it, and yields 32 maunds for a first-rate crop.

Ginger fit for planting again sells at eight to ten seers per rupee; that for use only, at twenty-four to thirty-two seers per rupee.

In order to dry ginger into "sonth," the fresh roots are put into a basket, which is suspended by a rope, and then two men, one on each side, pull it to and fro between them by a bit of rope attached, and thus shake the roots in the basket; this process is carried on for two hours every day for three days. After this, the roots are dried in the sun for eight days, and again shaken in the basket. The object of the shaking together is to take off the outer scales and skin of the roots. A two days' further drying completes the process, and sonth sells three seers to four seers per rupee.

Turmeric is cultivated in the same manner; when ready it is dug up, steeped in hot water a day and a night, and then dried.

'78-1059. *Capsicums*. Shahabad.

'78-1060. Chillies. Nepal.

'78-1061-2. Chillies. Vizagapatam, Chittagong.

'78-1063. Cayenne. Madras.

A large number of species, probably chiefly *Capsicum fastigiatum* and *Capsicum frutescens*, appear under the name of chillies or red pepper. The dried ripe fruit is the part used, and some one or more of the numerous species of *Capsicum* yielding them are cultivated all over India. When powdered, they constitute chilly powder, or cayenne pepper.

'78-1064. Curry powder. Madras.

'78-1065-9. Turmeric, five samples (*Curcuma longa*). Berar, Bimlipatam, Nagode, Deyra-Doon.

Is the dried rhizome of a similar plant to ginger, which likewise is widely cultivated. The bright yellow powder of these rhizomes forms one of the chief ingredients of the renowned "curry powder," which has such an important place in Indian cookery.

'78-1070-1. Wild nutmegs and mace, two samples. Bombay.

'78-1072. Mace. Malacca.

'78-1073. Tej Pat leaves. Madras.

'78-1074. Cinnamon. Malacca.

'78-1075. Kali Jeera. Faridpur.

'78-1076-9. Adjwan, four samples (*Ptychotis ajowan*). Berar, Oudh, Faridpur, Vizagapatam.

These little aromatic seeds are employed by the natives for medicinal and culinary purposes. They may be purchased in any bazaar in India, and are one of the most common of carminative seeds.

'78-1080-2. Coriander, three samples (*Coriandrum sativum*). Berar, Oudh, Faridpur.

The Coriander plant is cultivated extensively in India for the sake of its seeds, which enter into the composition of curry powder, and are employed in other ways as a spice or condiment, and as a medicine. The green plant is

also used as a vegetable, and is exposed for sale in the bazaars during most of the year.

'78-1083-4. Dill seed, 2 samples (*Anethum sowa*). Faridpur, Dharwar.

'78-1085-6. Fennel seed, 2 samples (*Fœniculum pannorium*). Oudh, Sind.

The fennel seed found in the Indian bazaars is the produce of this species, which is regarded by some as only a variety of *Fœniculum vulgare*. Its uses and properties are similar to those of the other umbelliferous seeds, such as Carraway, etc.

'78-1087-90. Fenugrec, 4 samples (*Trigonella fœnugrecum*). Vizagapatam, Faridpur, Sind, Kattywar.

'78-1091. Water-lily stems (*Nelumbium speciosum*). Sind.

'78-1310. Garlic. Vezagapatam.

'78-1311. Garlic. Berar.

CLASS A^{xiv}.

OIL SEEDS.

'78-1092-1100. Linseed. *Linum usitatissimum*. 10 samples from Faridpur, Ahmednuggur, Khandeish, Nagpore, Berar, Central Provinces, Rajshahye, Bengal, and Indore.

Large quantities of linseed are imported into Britain from India. The oil is obtained either by simple expression without the aid of heat, when it is of a pale, yellow color, or by the application of a temperature of not less than 200° Fahr. In the latter case it is of a deep yellow or brownish color and disagreeable odor. The oil prepared in India is inferior to that of Europe, from the fact that the Indian seeds being mixed with those of mustard, with which they are grown, the dyeing properties of the oil are impaired. Linseed contains one-fifth of its weight of mucilage (entirely resident in the testa) and one-sixth of its weight of fixed oil.

'78-1101-10. Teel seed. *Sesamum Indicum*. 10 samples from Bombay, Bengal, Vizagapatam, Dharwar, Berar, Central Provinces, Bombay, Ahmedabad, and Madras.

Three varieties of sesame seed are cultivated in India—the white-seeded (*Suffed-til*), the red or parti-colored (*Kala-til*), and the black variety (*Tillee*); it is the latter which affords the greater proportion of the Gingelly oil of commerce. At the commencement of 1861, white seed was worth in the London markets 65s.; black and brown, 58s. and 60s. per quarter.

A second sort of sesame oil, sometimes called "rape," is obtained from the red-seeded variety.

Black sesame is sown in March, and ripens in May. Red sesame is not sown till June.

Sesamum seed has of late been exported largely to France, where it is said to be employed for mixing with olive oil.

'78-1111-14. Curdy seed. *Carthamus tinctorious*. Four samples from Dharwar, Central Provinces, Ahmednuggur, and Faridpur.

These seeds yield by expression an oil which, when properly prepared and refined, is transparent, and of a light yellow color. It is used in India for culinary and other purposes. This oil deserves more attention than it has hitherto received in this country; and if once fairly introduced, there is no doubt whatever of its becoming a staple import. It is used in some of the Government workshops as a "drying oil." It is believed to constitute the bulk of the celebrated "Macassar oil." The seed is exported under the name of Curdee or safflower seed. In Oude it is sown in October, either alone or along the edge of wheat crops; both light and heavy soils are adapted to it. It is cultivated in every village, but not extensively. There would be no difficulty in further cultivating it to any extent. The cost of the seed, which is called "Barré," is 18 $\frac{3}{4}$ seers per rupee, and the cost of the oil is from 3 to 4 seers per rupee.

'78-1115. Sunflower seed. *Helianthus annuus*. Kahndeish.

'78-1116-20. Niger seed. *Guizotia oleifera*. Five samples from Dharwar, Ahmednuggur, Bengal, Kolapore, and Tanna.

These seeds of a composite plant are much esteemed as an oil seed, and as such enter into European commerce. The plant is commonly cultivated in Mysore and the Deccan. The oil is sweet tasted, and is used for the same purposes as Gingelly oil.

'78-1121-4. Poppy seed. *Papaver somniferum*. Five samples from Central Provinces, Bengal, Central India, Oudh.

The seeds yield by expression about 50 per cent. of a bland and very valuable oil, of a pale golden color, fluid to within 10° of the freezing point of water. It dries easily, is inodorous, of agreeable flavor, and partially soluble in alcohol. The seed is worth about 61s. in the English market. By simple exposure to the rays of the sun in shallow vessels the oil is rendered perfectly colorless. It is expressed by means of a heavy circular stone, placed on its edge, made to revolve by a long lever, and the apparatus is worked by draught bullocks.

The seed has no narcotic qualities, but has a sweet taste, and is used, parched, by the lower class of the natives as food; it is also much used by the sweet-meat makers as an addition in their wares.

'78-1125. Mustard. *Sinapis glauca*. Maunbhoom.

'78-1126. Mustard. *Sinapis dichotoma*. Calcutta.

'78-1127. Mustard. *Sinapis dichotoma*. Punjab.

'78-1128. Mustard. *Sinapis sp.* Central India.

'78-1129. Mustard. *Sinapis ramosa*. Dharwar.

- '78-1130. Mustard. *Sinapis sp.* Dacca.
 '78-1131. Mustard. *Sinapis dichotoma.* Howra.
 '78-1132. Mustard. *Sinapis glauca.* Shahabad.
 '78-1133. Mustard. *Sinapis glauca.* Sarun.
 '78-1134. Mustard. *Sinapis glauca.* Central India.

Several species, or at least distinct varieties, of *Sinapis* are cultivated throughout India for the sake of their oil, which is much esteemed for cookery, for medicine, and for anointing the person.

- '78-1135-8. Ground nuts. *Arachis hopygæa.* Five samples from Ahmednuggur, Khandeish, Berar, and Indore.

The ground nut is extensively cultivated in various parts of India; the kernels yield about 44 per cent. of a clear, pale, yellow oil which is largely used as food, and as fuel for lamps. The value of ground-nut kernels in London is about 16*l.* 10*s.* per ton, and of the oil 42*l.* to 43*l.* per ton. For ordinary purposes it is quite equal to olive oil.

- '78-1139-43. Castor-oil seed. *Ricinus communis minor.* Six samples from Baroda, Bombay, Dharwar, Bimlipatam, and Bengal.

- '78-1144-8. Castor-oil seed. *Ricinus communis major.* Five samples from Bombay, Central India, Central Provinces, Baroda, and Kahndeish.

The castor-oil plant is extensively cultivated all over India. It is sown in June by almost all the villages, not extensively, but principally for their own use. Its cultivation can be extended all over Oude. The oil is extracted by bruising the seed and then boiling it in water; the oil is afterward skimmed off. This is the only seed out of which the oil is extracted by boiling, as in this case it is found cheaper than the method used for other seeds, which is by pressure.

The cost of the seed is one rupee per maund, and the price of the oil is from two to five seers per rupee, according to the abundance of the crop in the season. The proportion of the oil yielded is about half the weight of the seeds boiled; it is only used for burning.

In Cuttack the plant is grown all over the province, a good deal in patches of newly-cleared land in the jungles of the Tributary States and Sumbulpore. The oil is extracted in two ways. It is used for burning and culinary purposes and medicinally also. The local market is now 11½ peculs of the seeds per rupee. Both the native methods of extracting oil are wasteful and tedious, and therefore expensive. European oil presses and a knowledge of some methods of clarifying the expressed oil seem only to be required to render the oil-seed crops of this extensive division of great value.

The large seeds, *Ricinis communis major*, are employed for lamp oil, and the small seeds of the variety *Ricinis communis minor* yield the medicinal castor oil.

'78-1149. Physic nut. *Jatropha curcas*. Khandeish.

These euphorbiaceous seeds yield a valuable oil, which has for some time been known to a limited extent in the English market.

'78-1150. Croton seed. *Croton tiglium*.

'78-1151. Hone seed. *Calophyllum inophyllum*. Mangalore.

'78-1152. Churonjee. *Buchanani latifolia*. Bengal.

'78-1153. Mowah seeds. *Bassia latifolia*. Central Provinces.

'78-1154. Poonja. *Pongamia glabra*. Bhopul.

'78-1155. Cress seed. *Lipidium sativum*. Aden.

'78-1156. Radish seed. *Raphanus sativus*. Sindh.

'78-1157. Black cumin. *Nigella sativa*. Bengal.

'78-1158. Black cumin. *Nigella sativa*. Aden.

'78-1159. Amadee. *Hibiscus cannabinus*. Khandeish.

'78-1160. Cotton seed. *Gossypium herbaceum*. Berar.

'78-1161. Moringhy. *Moringa pterygosperma*. N. India.

'78-1162. Kamala seed. *Mallotus Philippinensis*.

CLASS A^{xv}.

USEFUL INSECTS.—SILKWORMS.

Cases containing specimens of various kinds of silkworms of India; prepared by Mr. F. Moore, Assistant Curator, India Museum; viz.:

'78-1163. *Bombyx mori* (cocoons and moths). Cashmere.

Bombyx Cræsus (cocoons); the *Nistry* of Bengal.

Bombyx fortunatus (cocoons); the *Dasee* of Bengal.

Bombyx textor (cocoons); the *Boropooloo* of Bengal.

Cross between *Cashmere* and *Nistry* (cocoons). Bengal.

Cross between *Bengal* and *French* (cocoons). Bengal.

Bombyx Huttoni (worm, cocoon, and moths); the wild silkworm of N. W. Himalayas.

'78-1164. *Antheræa paphia* (Tusseh silkworm); worm, cocoons, and moths. Bengal.

'78-1165. *Attacus ricini* (*Eria* silkworm); worm, cocoons, and moths. Bengal.

CLASS A^{xvi}.

PEARL SHELLS.

'78-1166. Pearl oysters (*Meleagrina margaritifera*). Kurrachee.

Pearl-oyster banks exists off the coast of Kurrachee, in Sind, and on the eastern coast off Tinnevely and Tuticorin.

CLASS A^{xvii}.

ISINGLASS, ETC.

'78-1167. Edible birds' nests. Junk, Ceylon.

These are collected from the rock caves along parts of the Burmese coast, the Andaman and Nicobar Islands, for exportation to China, where they are considered a great luxury as an article of food. The nest is composed of inspissated mucus from the large salivary glands with which these birds are provided.

'78-1168. Fishmaws. Bombay.

Fishmaws are the swimming bladders or sounds extracted from the fish and dried in the sun. They are numerous prepared on the Malabar coast, and exported to Bombay, from whence large quantities are re-exported, principally to China and the Straits Settlements.

'78-1169. Shark's fin. Bombay.

Sharks' fins are largely exported from Bombay and Madras to China, where they are much esteemed, being used for the making of soups. From 7,000 to 10,000 cwts. are annually exported there from Bombay.

CLASS A^{xviii}.

'78-1170. Glue. Cawnpore.

CLASS A^{xix}.

WAX.

'78-1171. Two samples of Bees wax. Travancore.

'78-1172. Three samples of Bees wax. Pegu.

'78-1173. Bees wax. Rangoon.

'78-1174. Bees wax. Singapore, via Calcutta.

'78-1175. Bees wax [black]. Chota Nagpore.

There are several kinds of honey bees common in India. One species (*Apis* sp.) is kept in a semi-domestic state by the natives along the N. W. Himalayas, and in Kumaon, Kashmir, etc., the bees being hived in the walls of the houses. The hive consists of an earthen pot or other receptacle contained in a small chamber in the wall, and having but a small external opening for the entrance and exit of the bees, but closed internally by a cover, through which the honey is removed after the bees are stupefied by smoke.

The large wild bee (*Apis dorsata*) constructs its nest on the boughs of trees, making a comb about half the size of an ordinary cart-wheel. It is common throughout India.

CLASS A^{xx}.

TEXTILE SUBSTANCES OF VEGETABLE ORIGIN.

COTTON.

In the following series of cottons, each kind is represented by sample marked *a* in the seed, *b* roller-ginned, *c* saw-ginned, *d* and *e* seed obtained by each method of ginning.

- '78-1176. Broach.
- '78-1177. Broach grown in Dharwar.
- '78-1178. Dhollerah. Kala kuppas grown at Ranpoor.
- '78-1179. Dhollerah. Poomalia kuppas near Dhollerah.
- '78-1180. Khandeish.
- '78-1181. Hinghunhaut.
- '78-1182. Oomrawuttee Bunnie.
- '78-1183. Oomrawuttee Jerry.
- '78-1184. Coompta.
- '78-1185. Westerns.
- '78-1186. Tinnevelly.
- '78-1187. Sind.
- '78-1188. Dharwar American.
- '78-1189. Dharwar American.
- '78-1190. Dharwar American.
- '78-1191. Dharwar American, half pressed.
- '78-1192. Dharwar American, half pressed.
- '78-1193. Dharwar American, half pressed.
- '78-1194. Dharwar American, full pressed.
- '78-1195. Dharwar American, first picking.
- '78-1196. Dharwar American, second picking.
- '78-1197. American Upland.

In each of the following series *a* represents the kuppas, *b* cleaned, *c* seed, *d* yarn, all from the same cotton.

- '78-1198. Broach. (No yarn for this sample.)
- '78-1199. Dhollerah.
- '78-1200. Khandeish.
- '78-1201. Hinghunhaut.
- '78-1202. Oomrawuttee.
- '78-1203. Coompta.
- '78-1204. Westerns.
- '78-1205. Sind. (No yarn for this sample.)
- '78-1206. Dharwar American.
- '78-1207. Pressure experiment. (No yarn for this sample.)

Additional Specimens of Indian Cotton.

- '78-1208. Kala bolls from Pahlunpore, Guzerat.
- '78-1209. Bourbon bolls grown in Sind.
- '78-1210. Broach bolls grown in Sind.
- '78-1211. Dhakanioo bolls from Veerungaum.
- '78-1212. Jooria kuppas from Ahmedabad.
- '78-1213. Lallioo kuppas from Bhownugger.
- '78-1214. Bunnee kuppas from Boolundshur.
- '78-1215. Laria kuppas from Palunpoor.
- '78-1216. Laria [open podded kind] from Ahmedabad.
- '78-1217. Jooria from Ahmedabad [machine-ginned].
- '78-1218. Lallioo from Veerungaum [machine-ginned].
- '78-1219. Kala [cleaned] from Kutch.
- '78-1220. Broach [churka-ginned] from Sind.
- '78-1221. Akote [cleaned] from Berar.
- '78-1222. Dhakanioo bolls. Wudwan.

CLASS A^{xxi}.

FIBRES.

- '78-1252-3. Flax, 2 samples. *Linum usitatissimum*. Linn. Kangra ; Punjab.

Flax is mentioned by Strabo as one of the staples of this part of India. A small quantity of Riga seeds, which had been imported experimentally by Dr. Jameson, Superintendent of the Government Botanical Gardens at Sharunpore, was distributed among the peasants, with instructions as to the mode of cultivation; an agent of great practical experience was deputed to examine and report upon the qualifications of different districts for the growth of flax, and a staff of natives were trained by him to act as scutchers.

In 1856, two tons of flax produced under his superintendence in the district of Goojranwalla were sent to England, and were sold for 92*l.* 2*s.* 2*d.*, realizing a net profit of 47 per cent.

In 1857, 8 cwt. of flax, grown at Juddurah, a tract of country in the Kangra district, bordering on the river Beas, were sent home, and were valued at from 55*l.* to 60*l.* per ton.

In consequence of the success of these experiments, an association, called the "Indian Flax Company," sent out an agent to buy up flax produce. He made the district of Sealkote his headquarters, and, as far as could be judged, had every prospect of ultimate success, but, for reasons which it is unnecessary to enumerate here, the enterprise proved a failure.

- '78-1254. Rheea stems. *Bœhmeria nivea*.
- '78-1255. Rheea fibre. *Bœhmeria (Urtica) nivea*. Linn. Assam.

- '78-1256. Puya fibre. *Bœhmeria puoya*. Runipore.
 '78-1257. Puya fibre. *Bœhmeria puoya*. Assam.
 '78-1258. Neilgherry nettle. *Urtica heterophylla*. Roxb. Madras.
 '78-1259. Yercum fibre. *Calotropis gigantea*. Shahpore.

Prepared as follows:—

The branches are gathered and dried in the sun for from twenty-four to thirty-six hours, when they are taken up, the bark peeled from the woody parts, and the fibres gathered. If placed out in the dew for a night they lose their greenish tint, and become white.

- '78-1260. Bendolee Sutta fibre. *Pæderia fœtida*. Assam.
 '78-1261. Jute. *Corchorus olitorius*. Linn.
 '78-1262. Barriala. *Sida rhomboidea*. Roxb. Bengal.

This fibre is very similar to jute in appearance, but it is considered to be intrinsically so superior that it is worth from 5*l.* to 6*l.* more per ton, and it has accordingly been placed next to that fibre, in order to attract to it the attention which it deserves.

- '78-1263. Brown hemp. *Hibiscus cannabinus*. Bombay.

This plant furnishes a portion of the so-called "brown hemp," exported from Bombay. It is readily cultivated, and, with more attention to its preparation, is calculated to compete with jute.

Every ryot sows a small quantity along the edges of his usual crops for his own use. It is not, but it might be, cultivated extensively all over Oude, and in all kinds of soil. It is sown in the beginning of the rains, and when it commences to flower, it is cut and treated exactly in the same way as "sunn hemp" from *Crotalaria juncea*. The proportion of fibre is about half the weight of the plant. It is used for making rope, sackcloth, twine, paper, etc. The cost of the prepared fibre is from three to four rupees per maund, according to its strength, length, and cleanliness.

- '78-1264. Roselle (cleaned). *Hibiscus sabdariffa*.
 '78-1265. Roselle (uncleaned). *Hibiscus sabdariffa*.
 '78-1266. Indian mallow. *Abutilon Indicum*. Madras.

The plants are gathered and freed of their leaves and twigs, and are put out to dry in the sun for a couple of days. They are then taken up, tied into bundles, and placed under water for about ten days, after which they are taken out, and the fibres are well washed to remove the bark and other foreign matter that may be adhering to them, and are placed in the sun to dry.

- '78-1267. *Urena lobata*. *Crotalaria juncea*. Pegu.
 '78-1268. Hemp. *Cannabis sativa*. Linn. Kangra.

It grows spontaneously and in abundance everywhere in the submontane tracts, but is cultivated for the fibre only in the eastern portions of the Kangra, and in the Simla Hills. In 1859 an experimental consignment of two

tons of Himalayan hemp was valued in the English market at from 30*l.* to 32*l.* per ton, and during the past year another larger consignment of hemp has been dispatched at Government expense, by request of the merchants of Dundee. The price at Lahore is about 15*l.* or 16*l.* per ton.

'78-1269. Sunn fibre. *Crotolaria juncea*. Bengal.

'78-1270. Sunn hemp. *Crotolaria juncea*. Berar.

Cultivated near cities by hundreds of beegahs, but in the vicinity of villages only in small quantities, principally for the purpose of making fishing nets. Its cultivation can be extended all over Oude, and principally where a light soil exists. It is sown very thickly at the beginning of the rains, so that it may grow tall and thin. When it begins to flower, it is cut near the root, tied in large bundles, and immersed in water, putting some weight on it (generally mud) to prevent its being carried away. After remaining immersed from four to eight days, it is withdrawn from the water, taken by handfuls, beaten on a piece of wood or stone, and washed till quite clean, and the cuticle with the leaves completely removed from the other portion of the plant. Each handful is then piled musket fashion, and left to dry. When perfectly dry, the woody portion, which has been more or less broken, is separated from the fibre by farther beating and shaking. From 3 to 6 maunds of fibre are extracted from each beegah of plant. The fibre is used for making rope, sackcloth, nets, twine, and paper. The raw material on the field, as plant, costs from two to four rupees per beegah, according to quality; and the prepared fibre costs from four to ten rupees per maund, according to strength, length, and cleanliness of fibre.

'78-1271. Jubbulpore hemp. *Crotolaria tenuifolia*. Jubbulpore.

The cultivation of "hemp" in the district has received considerable impulse of late. Several years ago, Mr. Williams having occasion to send to Calcutta samples of wax, oil seeds, and other materials, filled up the box with indigenous hemp, to prevent breakage of the bottles. On arrival at Calcutta, the cleanliness and brightness of the fibre struck the consignee, who had it immediately examined by one of the proprietors of the patent ropewalks, who pronounced it equal to the best Russian hemp, and at once sent an order for 400 maunds of it. The trade has since gradually increased, and Mr. Williams now sends about 6,000 maunds of this fibre annually to Calcutta. The plant is regularly cultivated, but the cultivation is limited. About 10 per cent. of the fibre is lost in the process of heckling, and the cost varies according to the several places in the district and seasons of the year. The price of the prepared fibre is from 3*Rs.* 8*A.* to 4*Rs.* per maund. The present means of inland transport is by country carts at Mirzapore, which costs 1*Rs.* 8*A.* per maund, and from thence to Calcutta, by boats, at a farther cost of 1*Rs.* 4*A.* to 1*Rs.* 8*A.*, which, with other contingencies, such as covering for carts, or guard's hire, duty in native states, and agency charges at Mirzapore, brings up the cost of the material to 7 rupees per maund before it reaches Calcutta. Mirzapore is, at present, the nearest place of export. The great length of time in getting down bulky produce from Central India, and the enormous expense of transport have hitherto prevented

Mr. Williams sending his hemp to England ; but all this will be overcome the moment the railway line from Bombay to Jubbulpore opens, when the hemp can be landed at Liverpool in as many days as it now takes weeks by country carts and native boats to convey it from the station to Calcutta, and there is no doubt that in a very few years hemp, and also flax, will become large articles of export from the Saugor and Nerbudda territories.

'78-1272. Pine apple. *Ananassa sativa*. Malaca.

'78-1273. Pine apple. *Ananassa sativa*. Mangalore.

The leaves are gathered in the same way as the aloe, and are placed on a piece of board and scraped with a blunt knife. The fibres that are loosened are drawn out, the leaves turned over, and from four to six inches of the stem end scraped as before, and as soon as the fibres are loosened by the removal of the pulp in that part of the leaf, the fibres are taken hold of by the fingers and drawn out. These fibres are again laid on the board, and any remaining portion of the pulp gently scraped out with the aid of water, when they are gathered and dried in the sun.

By another mode of treatment, the leaves are laid in the sun so as to dry up a portion of the sap, when, on being taken up and bruised by the hand, the fibres become loosened, and may be taken hold of and drawn out. But a great loss of fibre results, so that this method cannot be recommended.

'78-1274. *Sansevieria Zeylanica*. Mysore.

'78-1275. Aloe fibre. *Agave Americana*. Madras.

'78-1276. Aloe fibre. *Agave Americana*. Madras.

'78-1277. Great aloe. *Fourcroya gigantea*. Madras.

The leaves, cut close to the stem, are placed on a piece of board, and beaten with a short stout stick. After being thus bruised, the pulpy portions are scraped out with a blunt knife, and the fibres subsequently washed in clean water and dried in the sun.

'78-1278. Adam's needle. *Yucca gloriosa*. Madras.

'78-1279. Plantain. *Musa paradisiaca*. Linn. Madras.

These fibres were prepared from the inner foot-stalks of the plantain tree. These were taken of certain length, placed on a piece of board, and the pulpy mass scraped out with a blunt knife. Both sides of the stalks having been thus scraped, whilst clean water was poured on to wash away the remains of the pulp, the fibres were dried in the sun.

'78-1280. Manilla hemp. *Musa textilis*.

'78-1281. Screw pine. *Pandanus odoratissimus*.

'78-1282. Screw pine fibre. *Pandanus odoratissimus*. Madras.

'78-1283. Brush fibre. *Cocos nucifera*. Singapore.

'78-1284. Coco-nut fibre. *Cocos nucifera*. Mysore.

'78-1285. Ejoo fibre. Yor or Gomuti. *Arenga saccharifera*.

'78-1286. Kittul. *Caryota urens*. Mysore.

'78-1287. Palmyra. *Borassus flabelliformis*. Madras.

'78-1288. Moonj. *Saccharum moonja*. Punjab.

Grows wild all over Oude, and is planted in hedges. The moonj or fibre is prepared from the vagina of the leaf just when the stem begins to bear flowers. Ropes for towing boats on rivers, and twine for bottoms of charpoys (bedsteads) are made from this fibre. If it is not occasionally wetted, and allowed to become too dry, it easily breaks when used. The prepared fibre costs two rupees per maund.

This grass supplies a strong, good fibre, which is beginning to attract attention in this country, and is now being exported from Kurachi and Sinde.

'78-1289. Mat grass. *Cyperus textilis*. Madras.

'78-1290. Khus Khus. *Anatherum muricatum*. Bengal.

'78-1291. Gyeegywot Shaw. Akyab.

'78-1292. Shaw Laybway. *Sterculia species*. Pegu.

'78-1293. Mat grass for common matting. Bengal.

'78-1294. Corah grass for matting. Tinnevely.

CLASS A^{xxii}.

WOOL.

'78-1295. (1.) Sheep's wool. Bombay.

'78-1296. (2.) Sheep's wool. Mysore.

'78-1297. (3.) Sheep's wool. Ladakh.

'78-1298. (4.) Sheep's wool. Ladakh.

'78-1299. (5.) Sheep's wool (pushm). Bokhara, *via* Punjab.

Sheep's wool is an article whose export is confined almost exclusively to Bombay and Sinde. It is principally obtained from the fat-tailed variety of sheep. These abound in the N. W. frontier districts of Peshawur, Kabul, Kandahar, Herat, and other places. Large flocks of sheep are reared also in the Thull and the Bar districts of the Punjab, whose shearings are estimated to produce annually about 400 tons of wool. Large quantities of wool are annually brought down the hills from Kunawur, on the backs of sheep, to the fair at Rampur.

In the Kangra districts vast flocks are also found, the wool from which is of good quality.

The flocks of Tibet are immensely numerous, and their wool of the finest quality, the cold climate having the usual effect on the fleece of supplying that peculiar quality which is found in the shawl-wool of the Tibet goat.

'78-1300. (6.) Goats' wool (white). Umritsur.

'78-1301. (7.) Goats' wool (hair). Punjab.

'78-1302. (8.) Goats' wool (pushm). Umritsur.

'78-1303. (9.) Goats' wool (pushm). Turfan.

- '78-1304. (10.) Goats' wool (pushm). Yarkand.
 '78-1305. (11.) Goats' wool (pushm). Yarkand.
 '78-1306. (12.) Thread of pushm wool (white). Punjab.
 '78-1307. (13.) Thread of pushm wool (dyed). Punjab.

Pushm, or shawl-wool, properly so called, is the downy substance growing next the skin and under the thick hair of the goats inhabiting Tibet, and other elevated regions to the north of the Himalayas. It is of three colors, white, drab, and dark gray. It is cut once a year, and if not shorn as the summer advances the animals themselves rub off the wool.

Before 1867 none of the fine Turfan pushm was allowed to pass through the Maharajah of Cashmere's territory into the British provinces. The Amritsar and Ludianah looms were consequently worked chiefly with a fine sheep's wool from Kerman, which, however, by no means comes up in softness and other qualities to the shawl-goat's down. A considerable amount of pushm from Changthan (or Chinese Tibet) always comes down to the Punjab; but this is much inferior to that of Turkistan. Even now, when free importation of shawl-wool is allowed, the cheaper Kerman material still holds its own with the Punjab weavers, hence the greater part of it still goes to Kashmir.

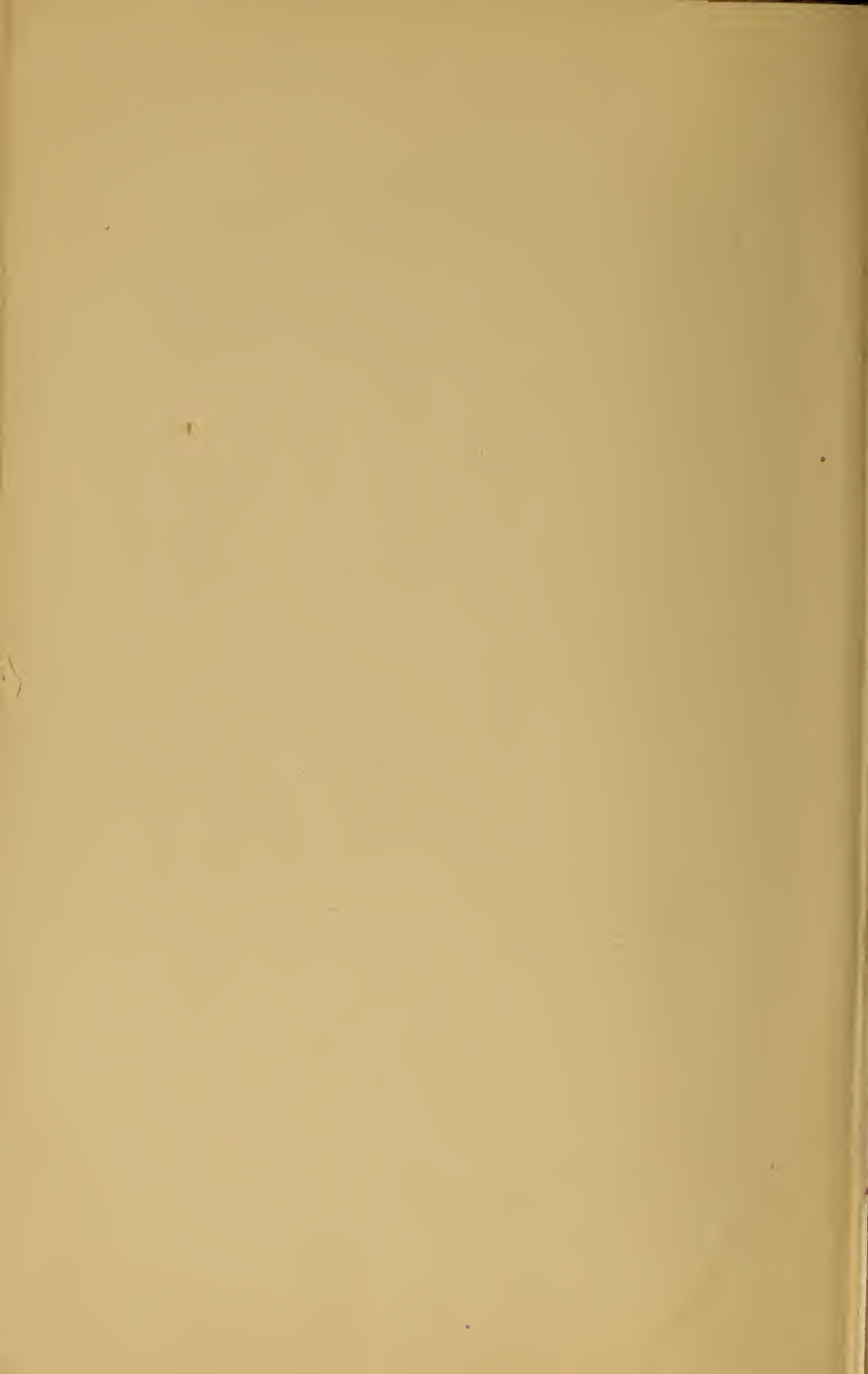
- '78-1308. (14.) Camels' wool. Bokhara.
 '78-1309. (15.) Camels' wool. Punjab.

Camels' wool is produced in the Bar and Thull, or waste tracts of Shahpur, Rhotak, Jhang, and Gugaira. The soft underwool is used for the manufacture of cloth for chogas of a common kind. An immense number of camels are employed by the merchants who carry on that portion of the trade of India with Central Asia which finds its egress and ingress on the borders of Scinde.

CLASS A^{xxiii}, A^{xxiv}, A^{xxv}.

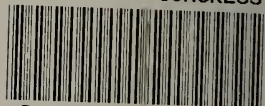
AGRICULTURAL IMPLEMENTS AND VEHICLES.

- '78-212. Plough and yoke. Berar.
 '78-213. Churka (native cotton-gin). Bengal.
 '78-214. Water-cart (model). Bombay.
 '78-215. Covered cotton cart (model). Bombay.
 '78-216. Covered cotton cart (model). Bombay.
 '78-217. Cotton cart (model). Bombay.





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